Jonas & Associates Inc.

REMOVAL SITE EVALUATION OF MERCURY IN SOIL AND GROUNDWATER AT FORMER MERCURY FULMINATE FACILITY

RICHMOND FIELD STATION

Richmond, California

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Submitted to:

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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

EXECUTIVE SUMMARY

The University of California (UC), Richmond Field Station (RFS) is located at 1301 South 46th Street in Richmond, California 94804. Beginning in the 1840s, several explosives manufacturing companies were operating in an area that is now the south-eastern portion of RFS. At the beginning of the 1900s, the California Cap Company (CCC) bought the land and one of the explosive manufacturing operations from the Hercules Powder Company.

CCC ceased operations at the end of World War II in 1945. UC purchased the property in 1950. The property is currently owned and operated by UC. Several different facilities, including research laboratories and administrative offices are located on this property. Currently, RFS is considering an addition of a new building at their facility. Due to the proximity of this proposed building to a former explosives manufacturing facility where mercury fulminate was produced, RFS decided to initiate the current investigation of mercury. Earlier investigations had indicated the presence of mercury in soils near this facility (DHS, 1982; CH2M Hill, 1988). Jonas & Associates Inc. (J & A) was retained in December 1989, under order 0-200248-TR to conduct the current investigation. The mercury contamination investigation is being performed according to the "National Oil and Hazardous Substances Pollution Contingency Plan, February 2, 1990 (NCP)."

Based on NCP requirements, UC has initiated a phased approach for the investigation of mercury contamination. Phase I is the performance of a Removal Site Evaluation, which has now been completed and the results are presented in this report. Following the Removal Site Evaluation, consideration of the need for Removal Action will commence as Phase II of the investigation. If Phase II evaluation indicates that removal action is appropriate, an Engineering Evaluation/Cost Analysis (EE/CA) or its equivalent will be performed. If collection of additional environmental samples becomes necessary, then a sampling and analysis plan will be prepared and submitted for regulatory review.

The scope of work for Phase I of the investigation was focused on the general area of the former mercury fulminate facility. The emphasis was placed on determining mercury concentration in soil. However, during the investigation a preliminary evaluation of nitrate, sulfate, copper, and zinc in soil samples was also conducted. In addition, an evaluation of mercury in groundwater was initiated by installation of one groundwater monitoring well in the study area. Groundwater from this well was analyzed for mercury. Mercury was not detected above the instrument detection limit of 0.001 mg/l in the groundwater sample.

RFS was included on the Department of Health Services (DHS) list of abandoned hazardous waste sites in 1981 because of CCC's explosive manufacturing activities. DHS began an investigation of the RFS property in this same year, at which time samples from five locations were collected and analyzed for mercury. Mercury was detected in two of these samples.

In 1982, DHS collected 17 additional soil samples from the RFS facility and analyzed the samples for a large suite of inorganic constituents. Mercury was not detected in any of the samples collected by DHS in 1982. Two of these samples were from the same locations as the earlier DHS samples collected in 1981. In the 1982 sampling effort, none of the inorganic constituents in soil samples exceeded the Total Threshold Limit Concentrations (TTLC) set by DHS to identify a material as hazardous. DHS concluded that no mercury remained on the RFS property and recommended that RFS should be removed from the list of abandoned hazardous waste sites.

In 1988, CH2M Hill collected additional soil samples at RFS. The purpose of this investigation was to follow-up on previous sampling activities and to supplement and/or clarify analytical results.

During this investigation three soil samples were collected in the general area of the former mercury fulminate facility. All soil samples were analyzed for metals, pesticides and PCBs. Copper and zinc in soil samples were detected below TTLC levels. Mercury in soils exceeded TTLC levels. Pesticides and PCBs were not detected in soil samples collected.

The Phase I investigation, which is the subject of this report, included collection of 147.. discrete soil samples (0 - 3 feet) collected from 47 boreholes; analysis of 49 composite soil samples for mercury; analysis of 4 composite soil samples for sulfate, nitrate, copper and zinc; and collection and analysis of 10 surface soil samples (0 - 3 inches) for mercury. Two soil samples were also analyzed for mercury using EP Toxicity Extraction and Waste Extraction (WET) tests. In addition, one groundwater monitoring well was installed and groundwater was sampled and analyzed for mercury. A total of 4 additional composite soil samples were collected from the monitoring well borehole and analyzed for mercury.

A summary of the findings for Phase I indicates that mercury is present in the soil above the TTLC level. No mercury was detected in the groundwater sample analyzed. Copper and zinc were present in the soil below TTLC levels, and sulfate and nitrate were detected in soil in low concentrations. Mercury was detected above the Soluble Threshold Concentration Level (STLC: 0.2 mg/l) using the Waste Extraction (WET) test. Mercury was not detected above the method detection limit of 0.02 mg/l in the soil sample that was analyzed using the EP Toxicity extraction method.

It is recommended that the following tasks be incorporated into Phase II of this investigation which is intended to serve as a preliminary Public Health and Environmental Evaluation (PHEE).

- Perform a preliminary Public Health and Environmental Evaluation (PHEE);
- Conduct field investigations as necessary to collect any additional data needed for the PHEE;
- Continue groundwater sampling and analysis; and

- Using information developed by the PHEE provide a quantitative basis for selection of an appropriate removal action.

However, the exact scope of work for the Phase II of the investigation will be finalized after UC's meeting(s) with DHS and other regulatory agencies review of this report

1.0 INTRODUCTION

The University of California at Berkeley (UC) has initiated a focused investigation of potential mercury contamination at the former mercury fulminate facility located within the Richmond Field Station (RFS), Richmond, California. Earlier investigations (summarized in Section 1.3) indicated the presence of mercury in soils within the study area. Jonas & Associates Inc. (J & A) was retained in December 1989, under order 0-200248-TR, to initiate an investigation of mercury contamination at the former mercury fulminate facility. The mercury contamination investigation is being performed according to the "National Oil and Hazardous Substances Pollution Contingency Plan, February 2, 1990 (NCP)." Based on NCP requirements, UC has initiated a phased approach for the investigation of mercury contamination. These phases are as follow:

Phase I - Performance of a Removal Site Evaluation[1] which includes:

- Performance of a removal preliminary assessment

  A removal preliminary assessment may include collection and review of data such as site management practices, information from generators, photographs, analysis of historical photographs, literature searches, and personal interviews conducted as appropriate.

- Performance of a removal site inspection

  A removal site inspection may be performed if more information is need. Such inspection may include a perimeter (off-site) or on-site inspection, taking into consideration whether such inspection can be performed safely.

Phase I has now been completed and the results are presented in this report.

Phase II - Following the completion of the removal site evaluation, consideration of the need for removal action will commence. Under the NCP, the following factors are to be considered by the lead agency in determining the appropriateness of a removal action:

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[1] As described in greater detail in this report, the analysis is approached as a "removal" action for NCP purposes due to the following factors: (1) the mercury contaminated soil appears to be localized and the mercury does not appear to be migrating, (2) no groundwater contamination has been detected, (3) all of the likely response actions are included in the listing of removal actions set forth in the NCP, 40 C.F.R. S 300.415 (d), (4) any response actions in the areas investigated would likely be independent from other potential response actions at the site, and (5) given the anticipated volume of the contaminated soil, no presently anticipated cleanup option would approach or exceed the $2 million threshold for removal actions.

- Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants;

- Actual or potential contamination of drinking water supplies or sensitive ecosystems;

- High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate;

- Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released;

- Threat of fire or explosion;

- The availability of other appropriate federal or state response mechanisms to respond to the release; and

- Other situations or factors that may pose threats to public health or welfare or the environment.

The Phase II (PHEE) study will evaluate the available data in relation to these factors.

Phase III - If the Phase II evaluation indicates that removal action is appropriate, an Engineering Evaluation/Cost Analysis (EE/CA) or its equivalent will be performed. If collection of additional environmental samples becomes necessary, then a sampling and analysis plan will be prepared and submitted for regulatory review.

Under the NCP, possible Removal Actions may include:

- Fences, warning signs, or other security or site control precautions -- where humans or animals have access to the release;

- Drainage controls;

- Stabilization of berms and dikes -- where needed to maintain the integrity of the structure;

- Capping of contaminated soils or sludges -- where needed to reduce migration of hazardous substances or pollutants or contaminants into soil, ground or surface water, or air;

- Using chemicals and other materials to retard the spread of the release or to mitigate its effects -- where the use of such chemicals will reduce the spread of the release;

- Excavation, consolidation, or removal of highly contaminated soils from drainage or other areas -- where such actions will reduce the spread of, or direct contact with, the contamination; and

- Containment, treatment, disposal, or incineration of hazardous materials -- where needed to reduce the likelihood of human, animal, or food chain exposure.

This report presents the findings of Phase I of the investigation and describes the site and the site's current status, defines the objectives of the investigation, provides a chronology of events, includes a general information on the geology and hydrology of the site and the region, presents the results of the recent soil and groundwater sampling investigation and provides a general discussion of the chemistry, toxicology, and migration pathways of mercury. A preliminary public health and environmental evaluation, proposed as part of the Phase II of the investigation, would present an in-depth analysis of the potential risks associated with exposure to mercury. If the Phase II evaluation indicates that removal action is appropriate, a Phase III EE/CA will be undertaken.

This report, Removal Site Evaluation of Mercury in Soil and Groundwater at Former Mercury Fulminate Facility, Richmond Field Station, is organized into six major sections:

Section 1:	Introduction
Section 2:	Initial Site Evaluation
Section 3:	Current Soil Sampling Study Conducted by Jonas & Associates Inc.
Section 4:	Groundwater Monitoring Well Drilling, Construction, Development, Sampling and Analysis
Section 5:	The Chemistry, Toxicology, and Migration Pathways of Mercury and Mercury Fulminate
Section 6:	Summary and Recommendations

Section 1 describes the site and the site's current status, defines the objectives of the investigation, and provides a chronology of the events occurring in the general area of the former mercury fulminate facility.

Section 2 provides a site description, describes the geology and hydrology of the site and region, and presents a summary of previous investigations performed by various consultants and DHS.

Section 3 presents the results of the recent soil sampling investigation conducted by J & A.

Section 4 includes details on groundwater monitoring well drilling, construction, development, and groundwater sampling and analysis.

Section 5 is a general discussion of the chemistry, toxicology, and migration pathways of mercury and mercury fulminate.

Section 6 provides a summary of activities and presents results and conclusions.

The references section cites documents consulted during the preparation of this report.

1.1 SITE LOCATION

RFS is located at 1301 South 46th Street in Richmond, California 94804. Figure 1-1 is a general map of the RFS property and adjacent areas. As identified in the figure, the 150-acre property is located between Highway 580 and the Richmond Inner Harbor. Figure 1-2 is a site map of buildings and roads in the southern section of RFS, where the former mercury fulminate facility was also located. Figure 1-3 is a composite of current building locations, (shown in black in the figure) and former structures, (shown as a hatched line in the figure). The former mercury fulminate area appears as a circle. The approximate locations of the former buildings were determined from aerial photographs provided by RFS.

1.2 SITE STATUS

The mercury fulminate facility was owned and operated by the California Cap Company during the 1920s. In 1981, RFS was included on the DHS list of abandoned hazardous waste sites because of the California Cap Company's explosives manufacturing activities. In addition, the Department of Fish and Game (DFG), San Pablo Sanitary District, and California Occupational Safety and Health Association (Cal OSHA) are aware that mercury may be present on the property.

To evaluate whether mercury was present at the site, DHS began an investigation of the RFS property in the general area of the mercury fulminate facility in 1981, at which time samples from five locations were collected and analyzed for mercury. Mercury was detected in two of these samples. In 1982, DHS collected 17 additional soil samples from the RFS facility and analyzed the samples for a large suite of inorganic constituents. Mercury was not detected in any of the samples collected by DHS in 1982. Two of these samples were from the same locations as the earlier DHS samples collected in 1981. In the 1982 sampling effort, none of the inorganic constituents in soil samples exceeded the Total Threshold Limit Concentrations (TTLC) set by DHS to identify a material as hazardous.

DHS concluded that no mercury remained on the RFS property and recommended that RFS should be removed from the list of abandoned hazardous waste sites. However, DHS continues to consider the facility as a "medium" priority until sampling results in areas previously tested can be verified.

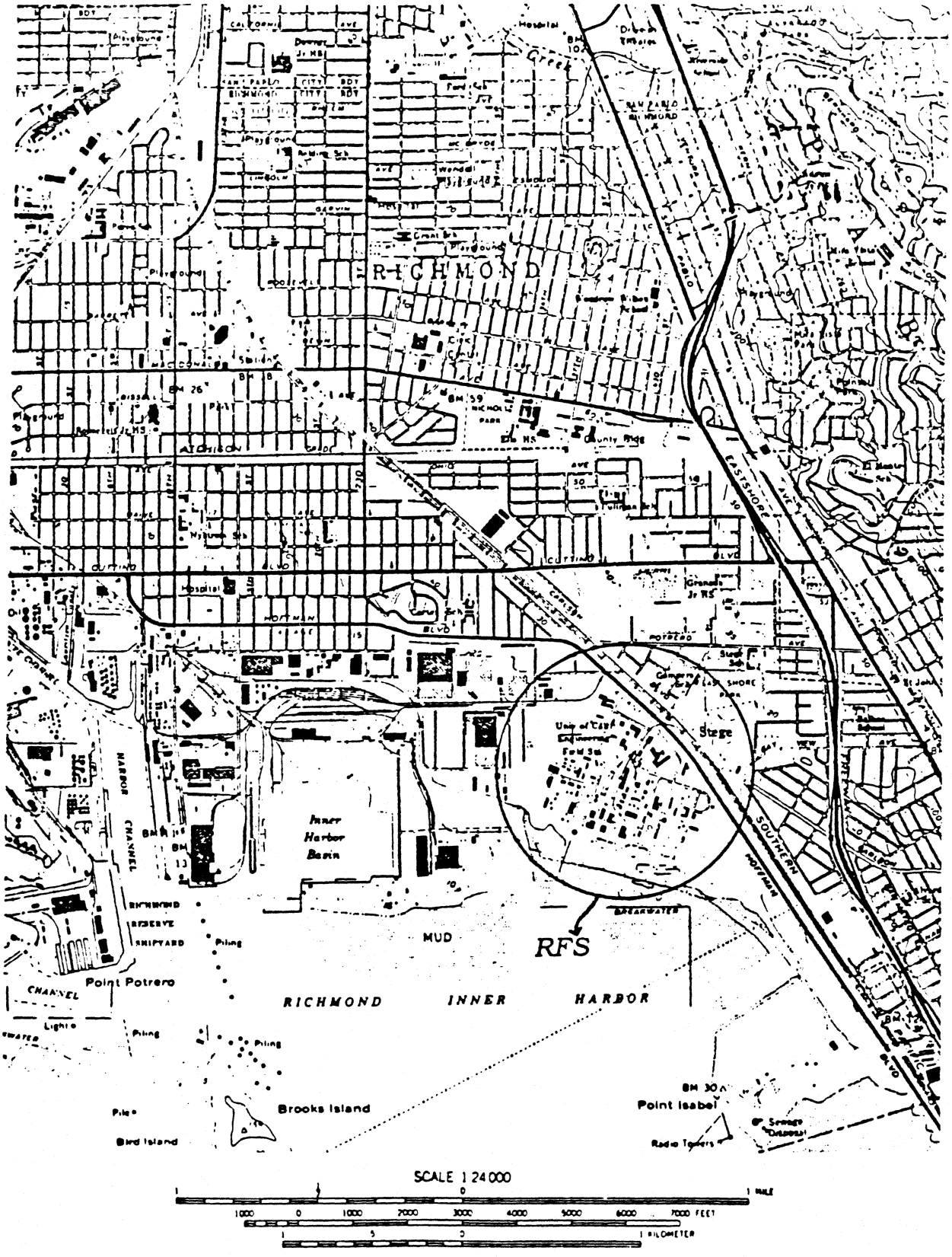

FIGURE 1-1

REGIONAL MAP

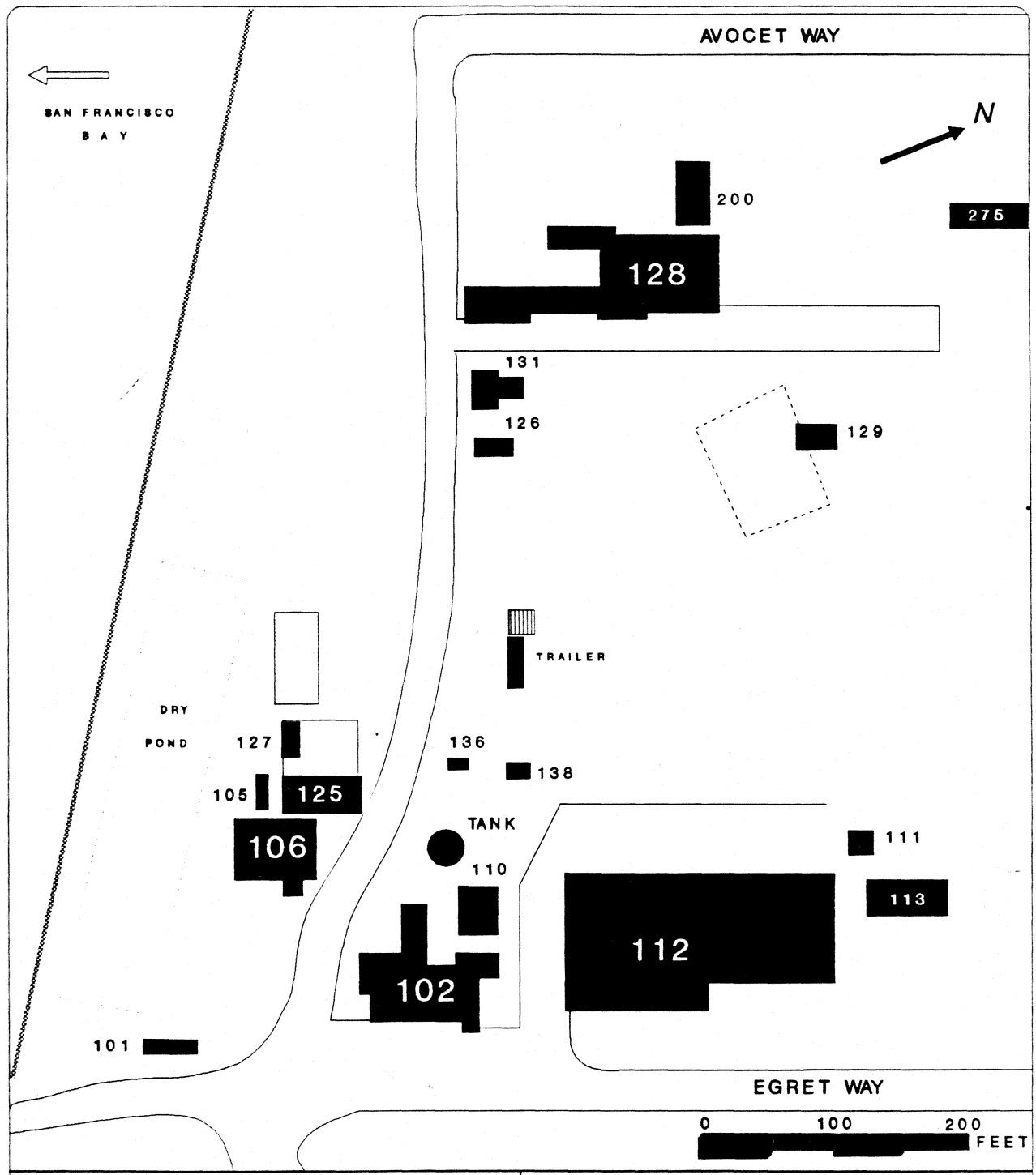

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FIGURE 1-2
SITE MAP - GENERAL AREA OF INVESTIGATION

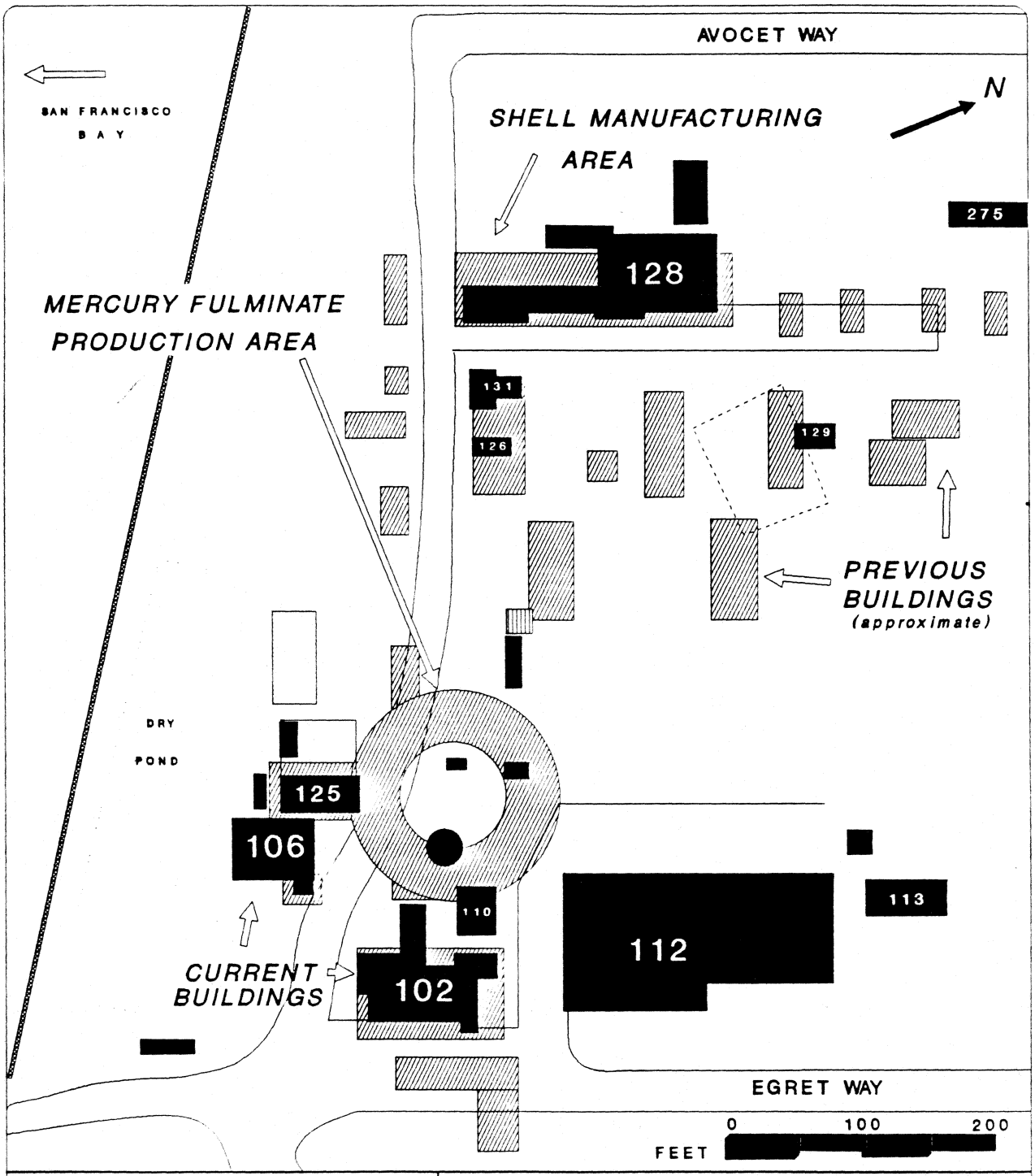

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FIGURE 1-3
CURRENT ▬ and
HISTORIC ▨ LAND USE
IN STUDY AREA

Currently, RFS is not under any regulatory order from state or federal agencies to conduct any additional investigations of on-site mercury. However, because RFS is considering an addition of a new building near the former mercury fulminate facility, investigation of mercury contamination was initiated.

1.3 CHRONOLOGY OF EVENTS

This section summarizes the history of pertinent activities occurring in the general area of the mercury fulminate facility from 1840 to 1990, including any related agency actions:

1840	Several explosives manufacturing companies were operating in the southern portion of current RFS property.
1900s	The California Cap Company bought a portion of the RFS property from the Hercules Powder Company.
1920	By 1920, California Cap Company had purchased all of the other explosives companies in the area, thereby becoming the only explosives manufacturer on the property.
1945	The California Cap Company ceased operations at the end of World War II.
1950	UC purchased the property. Under the terms of the sale, the California Cap Company was required to remove all hazardous material before UC would accept title. The company reportedly complied with this requirement, but the exact activities performed by California Cap Company are currently not known.
1981	In 1981, RFS was included on the DHS list of abandoned hazardous waste sites list because of the California Cap Company's explosives manufacturing activities. DFG, the San Pablo Sanitary District, and Cal OSHA agreed that fulminate of mercury might be present on the property, thereby presenting a risk of explosion and soil contamination. DHS began investigation of the RFS property in 1981.
2/18/81	In 1981, soil samples were collected from five locations by DHS. However, sampling and analytical methodologies performed are not known. Available data showed that mercury was found in two of these samples:

Sample 2, near the former Shell Manufacturing Area (see Figure 1-3), contained 105 parts per million (ppm) of mercury, and Sample 6, taken from the marsh, contained 23 ppm of mercury. A DHS report (DHS, 1982) indicated that arsenic, copper, zinc, and lead were also present in the RFS soil samples. However, the report did not identify concentrations.

6/24/82 In 1982, DHS collected 17 soil samples from RFS and analyzed them for 29 inorganic constituents. Mercury was not detected in any of the samples. None of the other inorganic constituents analyzed for exceeded TTLCs set by DHS to identify a material as hazardous. At least two samples were analyzed for DDT; none was detected. DHS concluded that no mercury remained on the RFS property and recommended that RFS be removed from the list of abandoned hazardous waste sites.

03/10/83 The Regional Water Quality Control Board (RWQCB) wrote to UC stating that RWQCB had received copies of the DHS sampling results and considered the elevated levels of various metals (excluding mercury) to pose a threat to water quality.

02/23/84 RWQCB requested that UC submit a proposal for further study of potential water quality effects from on-site soil contamination.

03/23/84 UC retained EAL Corporation (EAL) to analyze groundwater from two existing wells, and surface water, collected from the slough and marsh areas. The wells had been drilled previously for a research project and were completed approximately 90 feet below the ground surface.

04/05/84 EAL collected water samples in slough and marsh areas and sampled the two existing wells.

05/07/84 Report from EAL summarizing the April 5, 1984 sampling results.

07/05/84 RWQCB wrote a letter to UC requesting a water quality plan.

09/18/84 UC wrote a letter to RWQCB stating that, based on the previous sampling result and on surface runoff and infiltration information, RFS was not adversely affecting groundwater.

11/06/87 DHS requested copies of the existing sampling data.

11/17/87 UC sent requested data to DHS and asked that the site be removed from any hazardous site list.

1987 In 1987, DHS conducted another investigation of the facility, under U.S. Environmental Protection Agency (EPA) funding. The report concluded that no further EPA action or site investigation was necessary. DHS is continuing to consider the facility as a "medium" priority,

until sampling results in areas previously tested can be verified. DHS has indicated concern about the adequacy and quality assurance/quality control of its own sampling and analysis efforts, particularly the analytical results for soils sampled in 1982.

03/07/88 Aqua Science Engineers installed a groundwater monitoring well at RFS. Groundwater samples were collected to test for the possible presence of non-halogenated hydrocarbons that may have migrated from an existing underground fuel storage tank located outside of the study area.

06/03/88 Aqua Science Engineers submitted a report summarizing their results. Chemical analyses indicated that non-halogenated hydrocarbon concentrations in the groundwater ranged from below instrument detection levels for benzene, ethylbenzene, and total petroleum hydrocarbons (TPH), to 0.6 parts per billion (ppb) for xylene and 6.6 ppm for toluene.

10/18/88-11/02/88 CH2M Hill conducted additional sampling at RFS. The investigation was not required by DHS or RWQCB, but was initiated by UC to follow-up on previous sampling activities and to supplement and/or clarify analytical results.

During this investigation six soil sampling areas were identified and sampled throughout the RFS facility. Three of these sites were in the area occupied by the former mercury fulminate facility buildings. All samples collected were analyzed for metals. In addition, five samples (including the three samples from the former facility building sites) were analyzed for pesticides and PCBs. Levels of mercury above the TTLC were detected in the area of the former mercury fulminate facility. In addition to mercury, copper and zinc were found in these soils, but at concentrations below the TTLCs for these metals. Pesticides and PCBs were not detected in any of the soil samples analyzed.

12/89 to 3/90 J & A initiated a Phase I soil and groundwater sampling investigation in the general area of the former mercury fulminate facility as Phase I of the mercury investigation.

2.0 INITIAL SITE EVALUATION

The following section concerns the previous work performed in the former mercury fulminate facility and Shell Manufacturing Area (see Figure 1-3).

2.1 SITE DESCRIPTION

2.1.1 Property History and Adjacent Land Use

2.1.1.1 Property History

Beginning in the 1840s, several explosives manufacturing companies were operating in an area that is now the southeastern portion of RFS. At the beginning of the 1900s, the California Cap Company bought land and an explosive manufacturing operation from the Hercules Powder Company. By 1920, the California Cap Company had purchased all of the other explosives manufacturing companies in the area, thereby becoming the only explosives manufacturer on the property.

The California Cap Company ceased operations at the end of World War II in 1945. UC purchased the property in 1950. Under the terms of the sale, the California Cap Company was required to remove all hazardous materials before UC would accept the title. It is currently unknown if any corrective actions took place at that time.

RFS is currently owned and operated by UC. Throughout the years, several different buildings, including research laboratories and administrative offices, have been constructed on the property. Currently, RFS is considering an addition of a new building on the property. Figure 2-1 presents a possible future location for this proposed building. Due to the proximity of this proposed building to the former mercury fulminate facility, RFS decided to initiate an investigation of mercury at the former mercury fulminate facility.

2.1.1.2 Adjacent Land Use

Current land uses adjacent to RFS are primarily industrial. A Safeway Distribution Center lies to the north, the Price Club and Bio Rad Labs are located to the east, and ICI Americas (ICI) lies to the west of RFS. Prior to 1987, the ICI Americas property was owned by Stauffer Chemical Company. The Richmond Inner Harbor lies to the south of the facility, along the shoreline of the City of Richmond.

Under regulatory direction from RWQCB, ICI completed a preliminary investigation of its property in December 1987. Under a Remedial Action Program designed and implemented by ICI, shallow groundwater onsite, found to be contaminated with pesticides, is currently being extracted and treated. The RWQCB has requested that ICI Americas perform a hydrogeologic investigation of the closed cinder landfill and associated ponds also formerly operated by Stauffer.

Recently the Richmond Inner Harbor has come under the scrutiny of EPA, DHS and the RWQCB, due to elevated concentrations of contaminants found in the water and biota of the harbor.

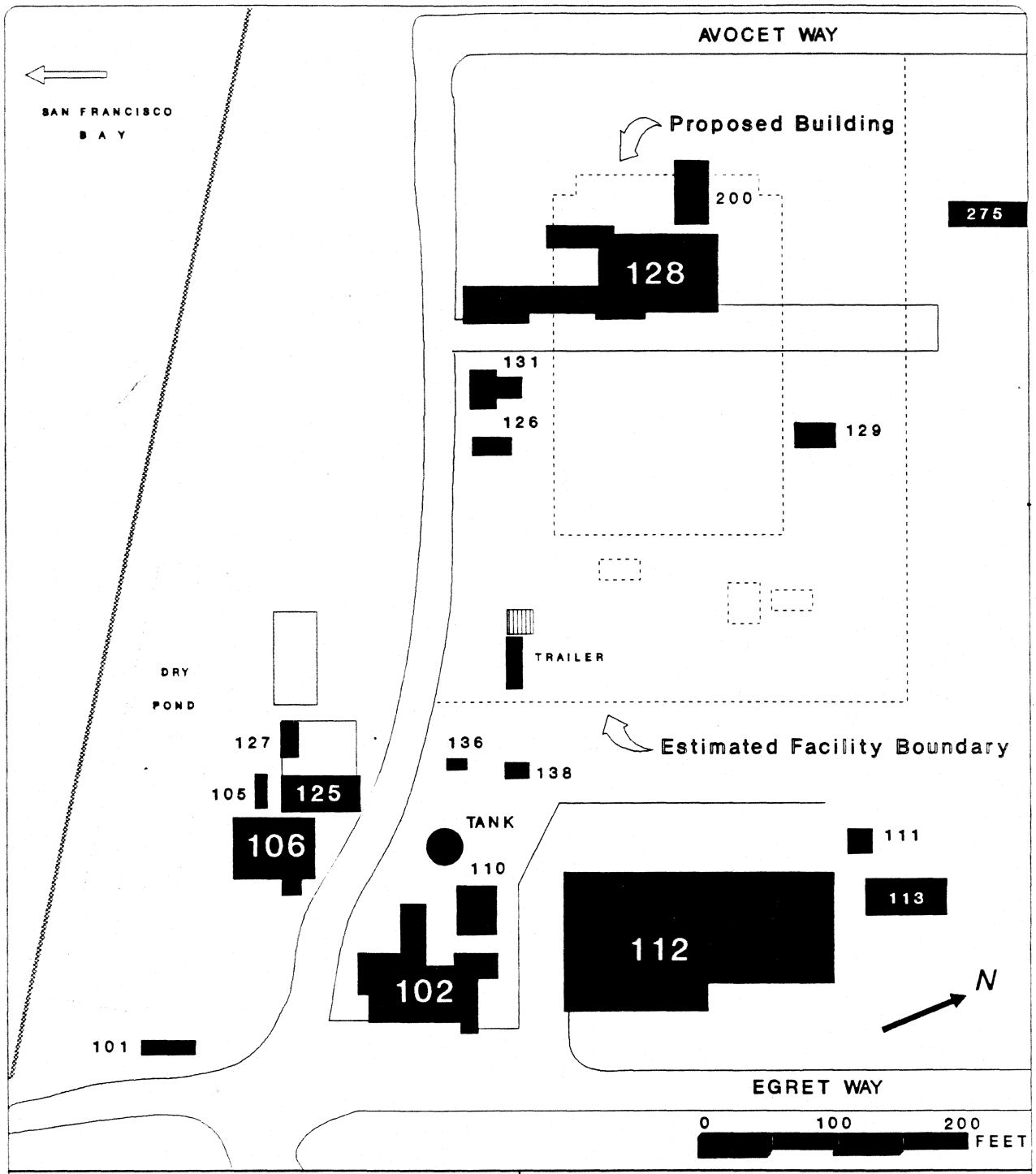

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FIGURE 2-1
PROPOSED FACILITY SITE AREA IN RICHMOND FIELD STATION

2.1.2 Environmental Setting

2.1.2.1 Regional Geology

RFS is located at the distal end of an alluvial plain that slopes in a southwesterly direction. To the northeast, towards the Berkeley Hills, the alluvial plain is transected by the Hayward Fault Zone (Jennings & Burnett, 1961). San Pablo Bay lies to the south of RFS.

The alluvial plain, upon which RFS is situated, is Quaternary in age representing relatively recent deposits. The lithology of the alluvial plain consists primarily of consolidated to unconsolidated clays, silts, sands, and gravels, and bordering Pablo Bay, organic-rich clays and silts. The total thickness of all these deposits ranges from surface deposits, where the alluvium thins against the Berkeley Hills, to approximately 300 feet in depth. These deposits are underlain by bedrock of the Mesozoic Franciscan Formation. The Franciscan Formation is a complex assemblage of serpentinite, greenstone, graywacke, chert, shale, sandstone, and schist, and is found on many ridges and mountains of the San Francisco Bay Region.

2.1.2.2 Local Geology

Subsurface geology of the upper 100 feet in the area of RFS has been characterized by two boring logs, drilled for wells installed on RFS property (EAL, 1984). Both of these logs indicate that approximately 8 feet of clay directly underlie RFS. Interbeds of poorly sorted gravels, sand, and clay, extending to a depth of approximately 40 feet below ground surface lie beneath the clay layer. Clay to gravelly clay occurs from approximately 40 to 90 feet below ground surface. Sandy gravel was encountered from approximately 90 feet to the bottom of the borings at approximately 102 feet below ground surface. These lithologic descriptions are summarized in Table 2-1.

Table 2-1

Borehole Stratigraphy

Depth Below Surface (feet)	Lithology
0 - 8	Silty clay
8 - 40	Interbeds of poorly sorted gravels, sands, silts and clays
40 - 90	Clay to sandy gravelly clay
90 - 102	Sandy gravel

Four borings were drilled to a depth of 60 feet below ground surface, adjacent to the eastern boundary of RFS, on the ICI Americas property (ICI Americas, 1988). The logs from these borings were not available, but the local subsurface conditions were described as predominantly fine-grained sands, silts, and clays with minor amounts of gravel, found in poorly graded deposits of sand, silts, and clays (Hall, 1988). Discrete lithologies identified in these boreholes did not appear to be laterally or vertically extensive within the upper 60 feet.

2.1.2.3 Surface Water

RFS is located adjacent to the Richmond Inner Harbor of San Pablo Bay. San Pablo Bay (in the northern portion of San Francisco Bay) forms the major surface water body to the south of the facility. Marshes border San Pablo Bay. Marshes at the southern extent of the facility drain south into San Pablo Bay through a single opening in a raised Santa Fe Railroad causeway.

No streams are present on the RFS property. Surface water runoff from the facility is collected and discharged through two storm drains, located at the southern extent of the property. These drains discharge into San Pablo Bay. To the west of RFS a tidal slough collects water from urban storm drainage throughout the City of Richmond. This slough is used by local industrial dischargers and is hydraulically connected with the marsh at the border of San Pablo Bay.

2.1.2.4 Regional Hydrogeology and Groundwater Quality

2.1.2.4.1 Regional Hydrogeology

RFS lies within the Alameda Bay Plain (ABP) Groundwater Basin (DWR, 1980). This groundwater basin extends southward from Richmond to Alvarado, between the Berkeley Hills and San Francisco Bay. The basin's hydrogeologic conditions are not well characterized because groundwater is currently not being used by local municipalities or for agricultural irrigation, due to its low permeability and the limited thickness of transmissive units.

Most groundwater recharge to the ABP groundwater basin in the Richmond area is probably from drainage through the beds of the Wildcat and San Pablo Creeks. Recharge from the infiltration of rainfall is believed to be limited due to the low permeability shallow clays and by the large amount of paved areas overlying the basin (Caltrans, 1978). Shallow groundwater probably eventually discharges into San Francisco Bay.

2.1.2.4.2 Local Hydrogeology

Local hydrogeology at the site is characterized from data obtained from monitoring wells installed on RFS property and the adjacent ICI Americas property (ICI Americas, 1988). Two groundwater monitoring wells are present at RFS. These wells are identified as MW-A and MW-1. MW-A is located approximately in the center of the RFS.

Monitoring well MW-1 is located behind Building 105, in the area of the former mercury fulminate facility (see Figure 1-2).

During the drilling of monitoring wells MW-A and MW-1, groundwater was first encountered at depths of 9.0 to 7.5 feet below ground surface, respectively. In the borehole for monitoring well MW-1, below a thick layer of clay, the first water-bearing unit composed of sand was located at a depth of 8 to 13 feet. This water-bearing unit was then screened. After monitoring well MW-1 was installed and allowed to equilibrate, the water level rose to 4.25 feet below the surface: indicating confined conditions. Because a thick clay layer exists below the surface, local groundwater probably occurs under confined to semiconfined conditions. Boring logs for MW-A and MW-1 are shown as Figures 4-2 and 4-3 in Section 4.0 of this report.

Geologic logs from boreholes drilled on RFS indicate that a second transmissive water-bearing unit of sandy gravel exists below a depth of 90 feet from the surface.

Groundwater in the vicinity of RFS is considered to flow from north-northeast to south-southwest, toward the Richmond Inner Harbor (Hall, 1988). Locally, a hydraulic cone of depression has been created by the groundwater extraction system currently operating at the adjacent ICI Americas facility. The center of this cone is located approximately 1,000 feet southeast of RFS border. Hall (1988) asserts that the actual cone of depression for the extraction system does not extend to RFS.

Several aquifer tests have been previously performed on RFS property. These tests were performed by the UC Sanitary Engineering Research Laboratory in 1954. A 3.5 foot gravelly aquifer was located at a depth of 90 feet below the surface. The average transmissivity was calculated from several tests to be 5,775 gal/day/ft. Dividing the calculated transmissivity by the measured thickness of the aquifer (3.5 feet), the estimated hydraulic conductivity, at 90 foot below the surface, is 1,760 gal/day/ft-squared (235 ft/day). These values indicate the gravelly aquifer located at a depth of 90 feet below the surface is a fairly transmissive zone. However, the shallower water-bearing zones are probably significantly less transmissive due to a greater presence of silts and clays in the aquifer material. Currently, no aquifer tests have been performed in the shallow water-bearing zone (8 to 13 feet below the surface) at RFS.

At the ICI Americas property, located adjacent to RFS, slug tests were conducted in the monitoring wells (Hall, 1988). These slug tests provided a rough estimate of hydraulic conductivity in shallow permeable zones of the upper 60 feet under the ICI Americas facility. The well completion details were not available for review. The calculated hydraulic conductivity values ranged between 0.4 to 17 gal/day/ft (0.05 to 2.3 ft/day). These values are well within the expected range for fine sand, silt, and clay (Freeze and Cherry, 1979).

The horizontal hydraulic gradient of the shallow groundwater at the ICI America property has been calculated to be approximately 0.004 (Hall, 1988). This was based upon a potentiometric surface map prepared from water level measurements from monitoring wells less than 60 feet deep. Using an estimated effective porosity of 0.25 and the hydraulic gradient of 0.004, shallow groundwater velocity is calculated to range between 0.3 to 13 feet/year.

The tidal effects on the hydraulics of the water-bearing units have not been evaluated.

2.1.2.4.3 Groundwater Quality

On February 24, 1990 a groundwater monitoring well, identified as MW-1, was installed by J & A downgradient from the former mercury fulminate facility. This well was installed to determine if mercury was present in the first water-bearing zone. After purging of the well, a groundwater sample was collected and analyzed for mercury and Total Dissolved Solids (TDS). No mercury was detected in the groundwater at the former mercury fulminate facility. The level of TDS reached 1,300 ppm.

In 1984, EAL analyzed groundwater samples from two existing wells and analyzed four surface water samples collected in the slough and marsh areas. The two existing wells had been drilled previously for a research project and were completed approximately 90 feet below the ground surface. These two wells are designated as wells 167 and 175. The results, presented in Table 2-2, indicate that the groundwater in the water bearing zone at 90 feet below surface met EPA Safe Drinking Water Act standards.

TABLE 2-2

Results of Existing Richmond Field Station Well Sample Analyses
(EAL Corporation, 1984)

	Sample 5 Well 167 (mg/L)	Sample 6 Well 175 (mg/L)	Safe Drinking Water Act Maximum Contaminant Level (mg/L)
Mercury	<0.0005	<0.0005	0.002
Copper	0.01	<0.006	1.0[a]
Zinc	0.083	0.067	5.0[a]
Iron	0.04	<0.02	0.3[a]
Lead	0.03	0.04	0.05

a. Secondary Maximum Contaminant Level (aesthetic rather than health-based standard)

Groundwater was also sampled at the ICI Americas site. Groundwater quality samples collected at the ICI Americas facility and presented in Table 2-3 indicate significant metal contamination. The ICI Americas facility and property is reported to be associated with the use of the following materials: fuels, pyrite cinders, sulfuric acid, ferric sulfate, pesticides, solvents, and alum (Hall, 1988). In November 1987, two rounds of samples were collected from wells completed less than 60 feet below ground

surface. The results, presented in Table 2-3, indicate that most of the metal analytes in groundwater sampled exceeded EPA Safe Drinking Water Act standards.

TABLE 2-3

Results of ICI Americas Well Sample Analyses
(ICI Americas, 1987)

Constituent	Range in Concentration (mg/L)	Safe Drinking Water Act Water Standard (mg/L)
Copper	<0.02 - 38	1.00[a]
Zinc	0.06 - 75	5.00[a]
Arsenic	0.005 - 0.088	0.05
Iron	0.07 - 840	0.30[a]
Cadmium	<0.02 - 0.15	0.01
Lead	all < 0.06	0.05
Aluminum	<0.3 - 44	- -

a. Secondary Maximum Contaminant Level (aesthetic rather than health-based standard)

Limited water quality data for local groundwater encountered in borings less than 50-feet deep also exists in several Caltrans reports (1978 and 1979). Shallow groundwater from Caltrans borings taken in the vicinity of RFS was found to contain TDS ranging from 1,300 to 29,405 milligrams per liter (mg/l). In a more recent Caltrans investigation (1987), groundwater samples were collected from a series of 17 shallow wells to monitor the effects of a local freeway dewatering system. These wells were located to the north of RFS and further away from the influence of San Pablo Bay. With the exception of one well located near RFS which had TDS at greater than 1,000 mg/l, all other water samples contained TDS levels below 600 mg/l. In addition, the TDS concentrations in the deep wells that were constructed (to 50 feet) were generally less than the TDS concentrations in shallow wells (to 25 feet) which suggests that the shallower permeable zones are more prone to salt water intrusion from the Bay.

The RWQCB broadly defines a groundwater to have a beneficial use as a drinking water source when: 1) the groundwater is less than or equal to 3,000 ppm TDS; and 2) the aquifer produces a sufficient amount of water (approximately 150 gallons per day).

The groundwater sample collected from MW-1, in the area of the former mercury fulminate facility, showed no evidence of mercury contamination (detection limit of

0.001 mg/l). An additional analysis of a groundwater sample from monitoring well MW-1 (screened from 8 to 13 foot below surface), measured TDS at 1,300 mg/l.

2.1.2.4.4 Surface Water Quality

As discussed earlier, surface water drainage from the facility is discharged into storm drains. These storm drains are eventually discharged into San Pablo Bay. Results of a previous analysis of samples from the east and west storm drains and from the sloughs are presented in Table 2-4.

TABLE 2-4

Results of Slough and Storm Drain Sample Analyses
(EAL Corporation, 1984)

	Sloughs (mg/L)		RFS Storm Drains (mg/L)		Surface Water Quality Criteria[a] (mg/L)
	Sample 3 South	Sample 1 North	Sample 4 East	Sample 2 West	
Mercury	<0.0005	0.0005	0.001	<0.0005	0.0002
Copper	0.11	0.086	0.024	0.01	0.003
Zinc	0.072	1.1	0.56	0.76	0.095
Iron	2.4	0.55.	0.11	0.54	---
Lead	0.24	0.14	0.02	0.057	0.140

a. EPA National Ambient Water Quality Criteria to Protect Saltwater Aquatic Life, 1-hour average.

The results of the 1984 sampling by EAL indicate that with the exception of mercury, the concentrations of metals were higher in water from the sloughs than from the water in the storm drains that service RFS.

2.1.2.4.5 Water Uses

In the area of South Richmond, Caltrans (1978) conducted a door-to-door survey for wells. The results of this survey identified over 100 wells in the general area of RFS. All of these wells are upgradient from RFS. Given the absence of historic agricultural or residential uses downgradient or proximate to RFS, it is not likely that unknown wells are present.

2.2 SUMMARY OF THE PREVIOUS SOIL STUDIES (1981 - 1988)

2.2.1 Previous Investigations

DHS conducted two rounds of sampling at RFS between 1981 and 1982. Sampling locations are presented on Figures 2-2 and 2-3.

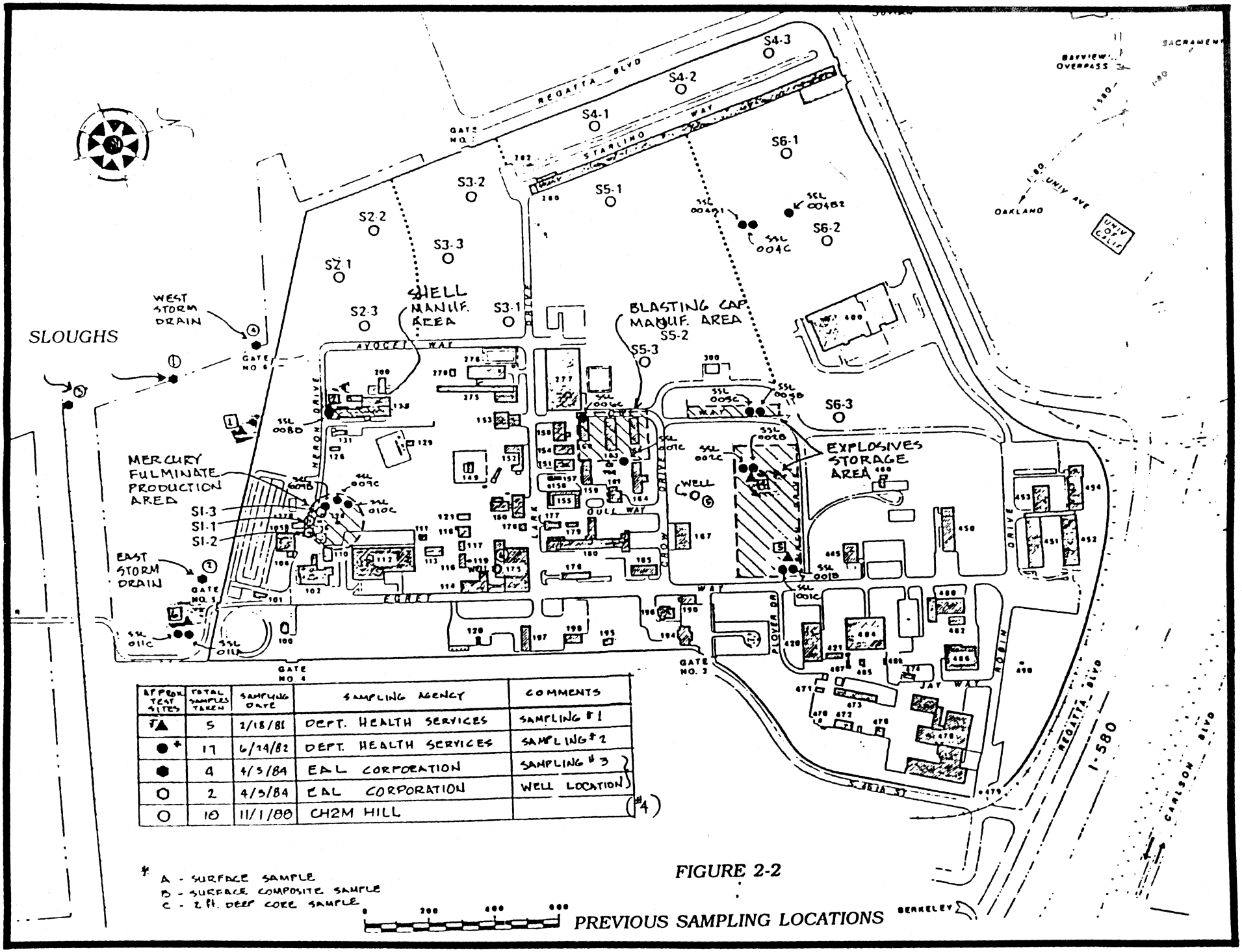
In 1981, DHS collected soil samples from five locations. The results from the analyses of these samples identified mercury at two locations: Sample 2, near the former Shell Manufacturing Area, and Sample 6 collected in the marsh adjacent to San Pablo Bay. Results from analyzing Samples 2 and 6 for mercury identified 105 and 23 milligram/kilogram (mg/kg), respectively in these samples.

In 1982, DHS collected 17 additional soil samples from the RFS property and analyzed the samples for a large suite of inorganic constituents. Mercury was not detected in any of the samples collected by DHS. Two of these samples were from the same locations as the earlier Samples 2 and 6, collected in 1981 by DHS. None of the inorganic constituents analyzed exceeded TTLCs set by DHS to identify a material as hazardous. DHS concluded that no mercury remained on the RFS property and recommended that it should be removed from the list of abandoned hazardous waste sites.

In 1988, CH2M Hill collected additional samples at RFS. The purpose of this investigation was to follow-up on previous sampling activities and to supplement and/or clarify analytical results. Neither DHS nor RWQCB had requested that additional investigations be conducted at RFS. This program was an effort on the part of RFS to become more knowledgeable of previous hazardous waste management practices at the facility.

During this investigation three soil samples were collected in the general area of the former mercury fulminate facility. These samples are identified as SI-1, SI-2, and SI-3 on Figures 2-2 and 2-3. To collect these samples, test pits were excavated to approximately two feet. In each pit, samples were collected at various depths along the wall. These samples were then composited. After the sampling, the pit was refilled with the excavated soils. Prior to sample collection, the air in the pit was tested for the presence of volatile organic compounds using an HNu. No HNu measurements above background were recorded during sampling. All of the soil samples were analyzed for metals, pesticides, and PCBs. Pesticides and PCBs were not detected above analytical method detection limits. The concentrations of metals detected above analytical method detection limits are presented in Table 2-5.

Results from analysis of soil sample SI-1 indicate the presence of 260 mg/kg of mercury. Samples SI-2 and SI-3 also contained mercury, but at much lower concentrations of 0.53 and 0.34 mg/kg, respectively. All samples were collected from the site of the former mercury fulminate facility. The TTLC for mercury is 20 mg/kg, as specified in the California Code of Regulations, Title 26.



APPROX TEST SITES	TOTAL SAMPLES TAKEN	SAMPLING DATE	SAMPLING AGENCY	COMMENTS
▲	5	2/18/81	DEPT. HEALTH SERVICES	SAMPLING #1
● *	17	6/24/82	DEPT. HEALTH SERVICES	SAMPLING #2
●	4	4/5/84	EAL CORPORATION	SAMPLING #3
○	2	4/5/84	EAL CORPORATION	WELL LOCATION
○	10	11/1/80	CH2M HILL	(#4)

* A - SURFACE SAMPLE
B - SURFACE COMPOSITE SAMPLE
C - 2 ft. DEEP CORE SAMPLE

FIGURE 2-2

PREVIOUS SAMPLING LOCATIONS

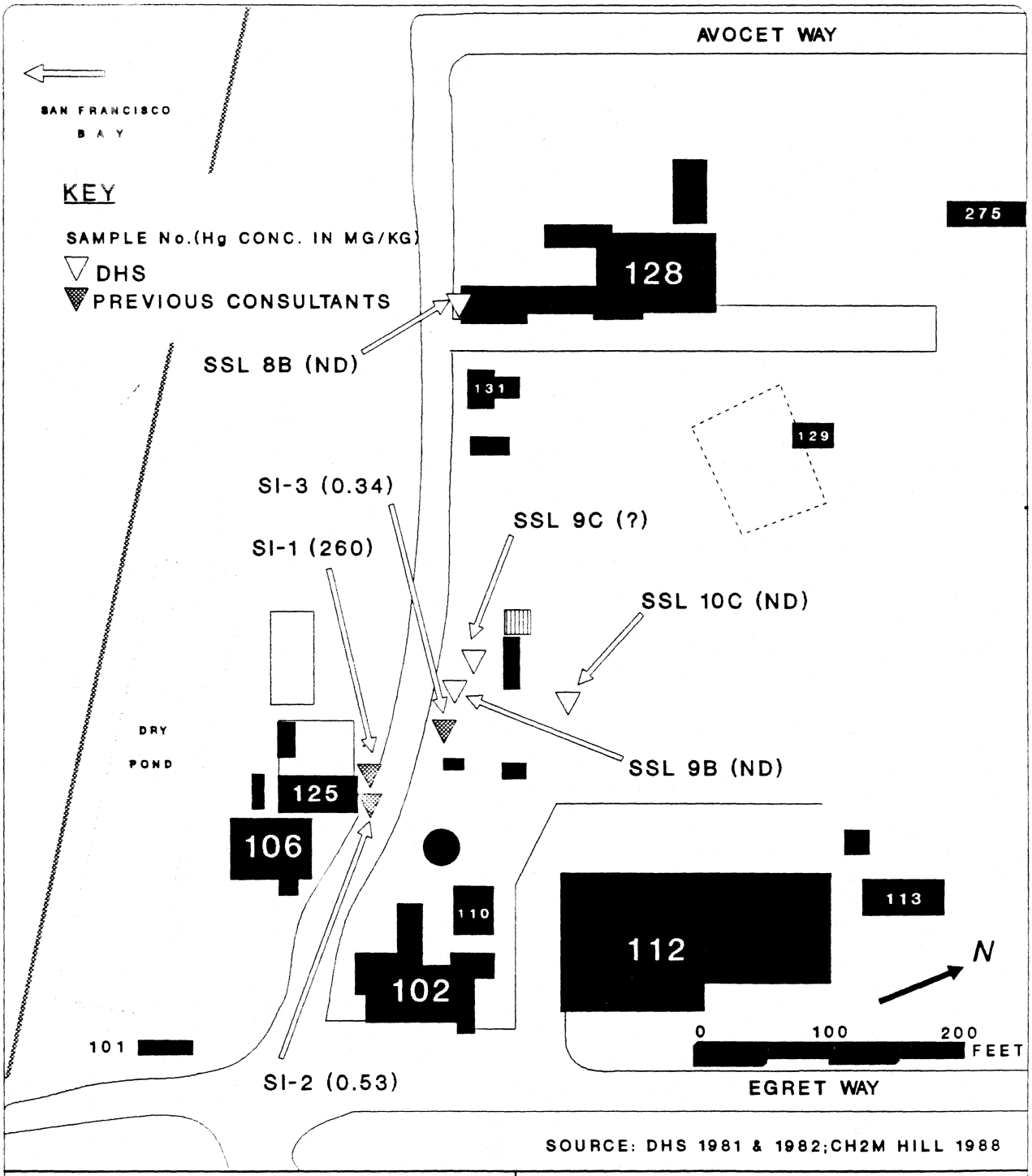


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FIGURE 2-3
PREVIOUS SOIL MERCURY RESULTS

TABLE 2-5

Results of 1988 Soil Samples
Collected From the Former Mercury Fulminate Facility
(CH2M Hill, 1988)

	SI-1 (mg/Kg)	SI-2 (mg/Kg)	SI-3 (mg/Kg)	TTLC (mg/Kg)
Mercury	260	0.53	0.34	20
Copper	223	47	16	2,500
Zinc	436	100	24	5,000

3.0 CURRENT SOIL SAMPLING CONDUCTED BY JONAS & ASSOCIATES

3.1 SAMPLING METHODS AND PROCEDURES

3.1.1 Sample Collection and Analysis

From December 1989 through February 1990, four rounds of soil samplings were performed by J & A. Figure 3-1 shows sampling locations. The soil investigation was divided into three tasks. The purpose of task 1 was to define the horizontal extent of mercury in soil from 0 - 3 feet in depth range. Task 2 was conducted to determine concentration of mercury in surface soils (0 to 3 inches). Task 3 included soil sample collection from the borehole of the groundwater monitoring well, MW-1. Each task is described below.

3.1.1.1 Task 1 - Soil Sample Collection from 0 to 3 Feet Depth Range

In order to determine the horizontal extent of mercury in soil from 0 - 3 feet in depth range, 147 discrete soil samples (6 duplicates = 2 composites) were collected from 47 boreholes. At each borehole three discrete soil samples were collected; 0 - 1 foot, 1 - 2 feet, and 2 - 3 feet below the surface. During the on-site field effort, soil samples were obtained using a two-inch stainless steel hand auger. A sufficient amount of soil was collected for the selected laboratory analysis. The minimum sample volume required for laboratory analysis was 270 grams. Immediately after collection, samples were transferred to labeled, airtight sample containers. Sample containers from each borehole were sealed in an individual plastic bag. Samples were then placed into an insulated cooler for shipment to the laboratory, maintaining the temperature at approximately 4° Celsius. Upon receipt of samples by the laboratory, one composite sample was prepared per each sample location. A total of 49 composites were tested for total mercury (EPA Method 7471). Additional analyses are discussed below:

- The composite soil sample from boring B-21 was analyzed for mercury using EP Toxicity Extraction Method 3020/7470, to determine whether levels of mercury in soil exceeded the designated federal hazardous waste level of 0.2 mg/l.

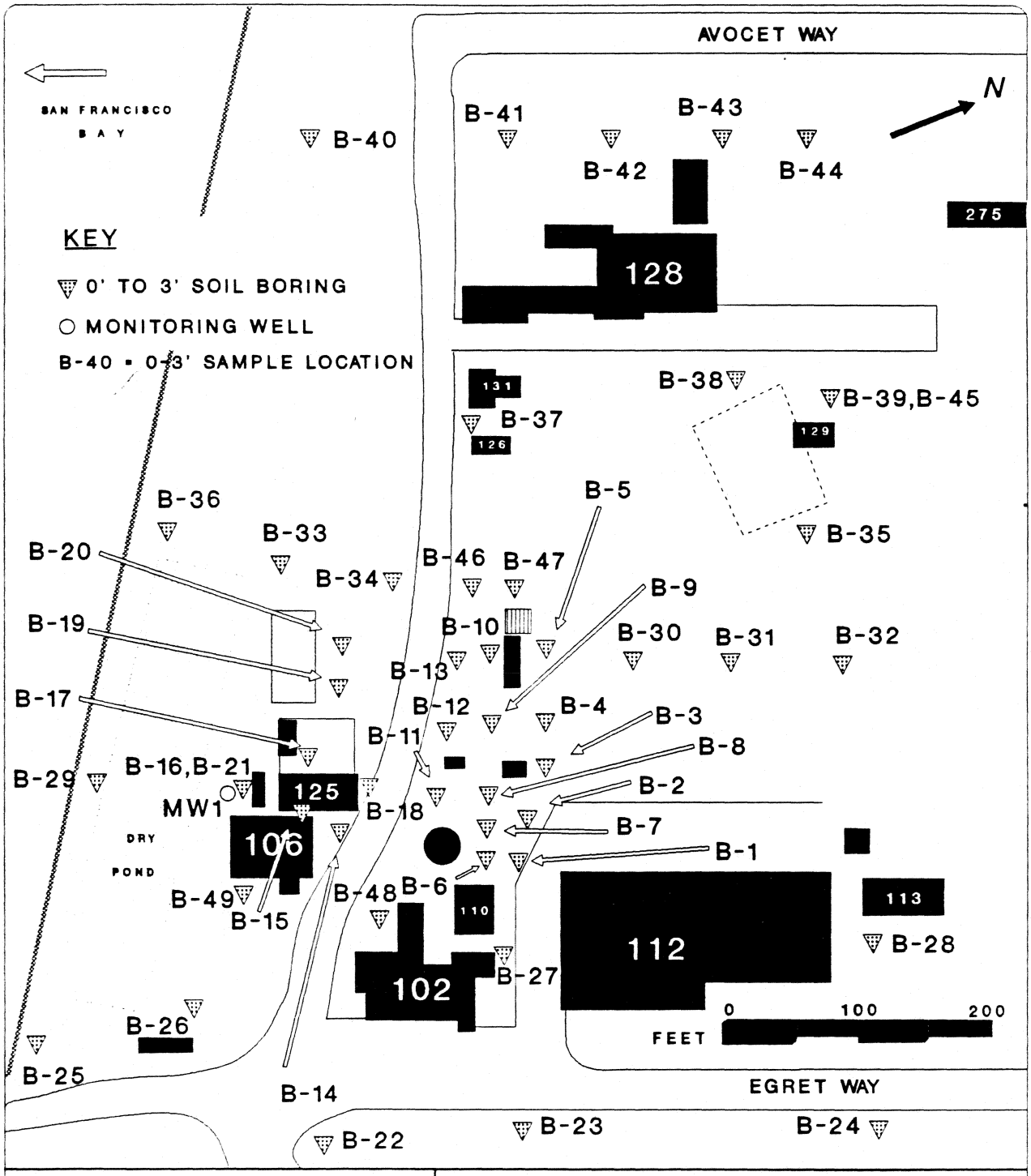

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FIGURE 3-1
LOCATION OF SOIL SAMPLES AND MONITORING WELL
(J&A, 1989-90)

- The composite soil sample from boring B-18 was analyzed for soluble mercury using the Waste Extraction Test (WET), EPA Method 7471, in order to determine whether levels of mercury in soil exceeded the State hazardous waste level of 0.2 mg/l.

- Mercury fulminate is prepared by the reaction of mercury, ethyl alcohol and nitric acid. Therefore, composite soil samples from borings B-21, B37, B-39, and B-42 were analyzed for nitrate (EPA Method 300). These sample locations were selected because they are situated in the immediate area proposed for future redevelopment.

- Composite soil samples from borings B-21, B-22, B-23, and B-24 were analyzed for sulfate (EPA Method 300). In the past, the area sampled (except B-21) was reported to have been flooded by aqueous sulfate solutions from the ICI Americas' ponds. A composite sample from B-21 was analyzed for sulfate to obtain a background concentration.

- Composite soil samples from borings B-12, B-18, B-38, and B-39 were analyzed for copper and zinc (EPA Method 6010). These analyses were performed for confirmation of the previous sampling results obtained by CH2M Hill (Table 2-5). Similar to the CH2M Hill results, copper and zinc were detected below TTLC levels.

3.1.1.2 Task 2 - Surface Soil Sample Collection

In addition to the samples discussed above, ten surface soil samples were collected (0 - 3 inches in depth) and are identified as surface samples "SS". These samples were collected near existing boreholes identified in Figure 3-1. The surface samples collected and corresponding adjacent boreholes are identified in Table 3-1. Samples were collected using a stainless steel scooper, and were placed in jars inside an insulated cooler (maintaining them at approximately 4° Celsius), and shipped to the laboratory. All samples were analyzed for mercury (EPA Method 7471). Surface samples SS4 and SS9 (along with the composite samples collected from boreholes B-18 and B-39) were also analyzed for copper and zinc (EPA Method 6010).

3.1.1.3 Task 3 - Collection of Soil Samples from the Groundwater Monitoring Well (MW-1) Borehole

During drilling of the groundwater monitoring well MW-1, soil samples were collected from 2.5 feet to 11.5 feet and from 14 to 15 feet. Composite samples from 2.5 - 4.5 feet, 5 - 6 feet, 6.5 - 7.5 feet, 8 - 9 feet were analyzed for total mercury (EPA Method 7471). These samples were obtained in order to determine the vertical extent of mercury in soil. Soil samples were collected in 6 inch brass tubes and composited at the laboratory. Soil samples from 10.5 - 11.5 feet and 14 - 15 feet were not analyzed by the laboratory. They were collected as lithologic samples only.

Table 3-1

Surface Samples and Corresponding Borehole Locations

(J & A, 1990)

Surface Samples	Corresponding Borehole Locations
SS1	B-6
SS2	B-3
SS3	B-12
SS4	B-18
SS5	B-16
SS6	B-20
SS7	B-10
SS8	B-37
SS9	B-39
SS10	B-43

Field Chain-of-Custody records (Appendix A) completed at the time of sample collection accompanied the samples inside the cooler for shipment to the laboratory. The samples were properly documented on the field chain-of-custody record by the sampling team. Each cooler contained sufficient ice and/or ice packs to ensure that proper temperature was maintained and each was packed in a manner designed to prevent damage to sample containers. All coolers were promptly delivered for analysis to the Curtis & Tompkins, Ltd. analytical laboratories by the J & A field crew.

3.1.2 Decontamination and Post-Sampling Procedures

Decontamination of equipment occurred at a specific zone designated at the site. Sampling equipment was decontaminated prior to initial use, between sample locations, and at the completion of sampling activities. Items requiring decontamination were the stainless steel hand auger, a stainless steel spoon and a scooper, and the split spoon used during well drilling activity. A manual scrubbing to remove foreign material followed by a thorough cleaning was used for decontamination of the above items. All non-disposable equipment was decontaminated according to the procedures summarized below:

- Manual scrub with non-phosphate soap solution followed by a tap water wash
- Tap water rinse

- o Distilled/deionized water rinse
- o 10% nitric acid rinse (for metals only)
- o Distilled/deionized water rinse
- o Air dry
- o Distilled/deionized water rinse

3.1.3 Sample Documentation

Sample documentation included field logbooks, sample labels, and Chain-of-Custody forms. All field documentation was written legibly in waterproof ink. Errors were crossed out with a single line, initialed, and dated.

3.1.4 Sample Identification Numbers

Each sample was assigned a unique identification number that will allow retrieval of information regarding the sample. The sample identification number consists of three main parts, separated by a hyphen. The first part identifies the boring number, and is made up of the letter "B" and a one or two digit number representing the boring number. The second part represents the sampling depth. The third part, is the sampling date.

Example: B1-1-011690
Represents: Boring # 1, taken at the depth of 1 foot on January 16, 1990.

3.1.5 Field Logbooks

A project field logbook was used to document the following:

- o Date and time of log entries;
- o Field conditions (weather, terrain, hazards, etc.);
- o Personnel present during field operations;
- o Decontamination procedures;
- o Waste disposal procedures, and a daily inventory of wastes present onsite;
- o Field measurements taken, instrumentation used, and frequency of instrument calibration;
- o Maintenance of instruments;
- o Information recorded on sample labels, as well as the site identification number and the sampling depth;
- o Any unusual sample characterization; and
- o Other specific considerations pertaining to sample acquisition.

3.1.6 Sample Labels

A pre-printed adhesive label was affixed to each sample container (Figure 3-2). The information below was written on every sample label:

- o Project number;
- o Sample identification number;
- o Date of sampling;
- o Name of sample collector; and
- o Type of analysis requested.

Figure 3-2
Sample Label

Curtis & Topkins, Ltd.,
2323 Fifth Street
Berkeley, California 94710

SAMPLE NO._____DATE_____
CUSTOMER_____
SIGNATURE_____
TYPE OF ANALYSIS_____

3.1.7 Chain-of-Custody Records

A Chain-of-Custody record accompanied samples when they were shipped to the laboratory (Appendix A). The Chain-of-Custody documents the transfer of samples from one party to another. Additional information noted on this form includes:

- o Project number;
- o Sample identification number;
- o Date and time of sampling;

- o Type of sample; and
- o Type of analysis to be performed.

3.1.8 Quality Control Samples

During Phase I of the investigation, two duplicate soil samples were collected and analyzed for mercury. The locations of the duplicate soil samples are presented in Figure 3-1 and identified as B-21 and B-45. Duplication of samples is a means of checking field and laboratory procedures. They are collected, numbered, and sealed in the same manner as the other samples.

3.1.9 Sample Shipment

The J & A Technical Manager notified the Sales Manager at Curtis & Tompkins, Ltd. (CTL) a week before each round of sampling was scheduled to begin, so that the laboratory could prepare and ship the necessary coolers and sample bottles to the field team in advance. Each shipment of sampling supplies from CTL was accompanied by a cooler packing slip, which documented the number of coolers and the number and type of sample containers sent.

Samples were packaged for shipment in a cooler chilled with bags of ice. Sample jars were place in sealed Zip-lock bags. When possession of the samples was transferred, the individuals relinquishing and accepting custody wrote their names, the names of their organizations, and the time of custody transfer on the Chain-of-Custody Record(s).

3.2 DISCUSSION OF RESULTS OF SOIL ANALYSES

3.2.1 Results of Analyses for Mercury in Soil Samples

The results of the December 1989 and January 1990 J & A sampling efforts are presented in Figures 3-3 through 3-9. Figures 3-3, 3-4, and 3-5 present mercury concentrations from composite samples collected from the upper 3 feet of soil. Figure 3-6 presents mercury concentrations in the surface soil (0 - 3 inches). Figure 3-7 denotes the sulfate and nitrate concentrations in soil at 0 - 3 foot depth ranges. Figure 3-8 and 3-9 identify the concentrations of copper and zinc detected in soil samples collected from 0 - 3 foot depth ranges and from surface soil.

Results from 0 to 3 feet composite soil samples are presented in Table 3-2 and Figure 3-3.

Table 3 - 2

MERCURY IN 0 - 3 FEET OF SOIL
RICHMOND FIELD STATION
(J & A, 1990)

COMPOSITE SAMPLE[a]	MERCURY mg/kg	COMPOSITE SAMPLE[a]	MERCURY mg/kg
B1	3.5	B24	41.3
B2	9.6	B25	0.46
B3	3.3	B26	0.80
B4	4.8	B27	1.2
B5	19	B28	0.29
B6	22	B29	0.10
B7	26	B30	4.4
B8	28	B31	6.7
B9	61	B32	1.4
B10	90	B33	0.41
B11	25	B34	7.0
B12	180	B35	3.0
B13	7.4	B36	0.23
B14	8.1	B37	0.73
B15	27	B38	2.5
B16D[b]	28	B39D[b]	6.7
B17	140	B40	2.7
B18	630	B41	0.34
B19	27	B42	0.16
B20	20	B43	1.6
B21D[b]	44	B44	1.0
B22	11	B45D[b]	6.1
B23	2.2	B46	14
B24	41.3	B47	4.7
		B48	0.41

a. Composite samples identified by borehole number.
b. D = Duplicate

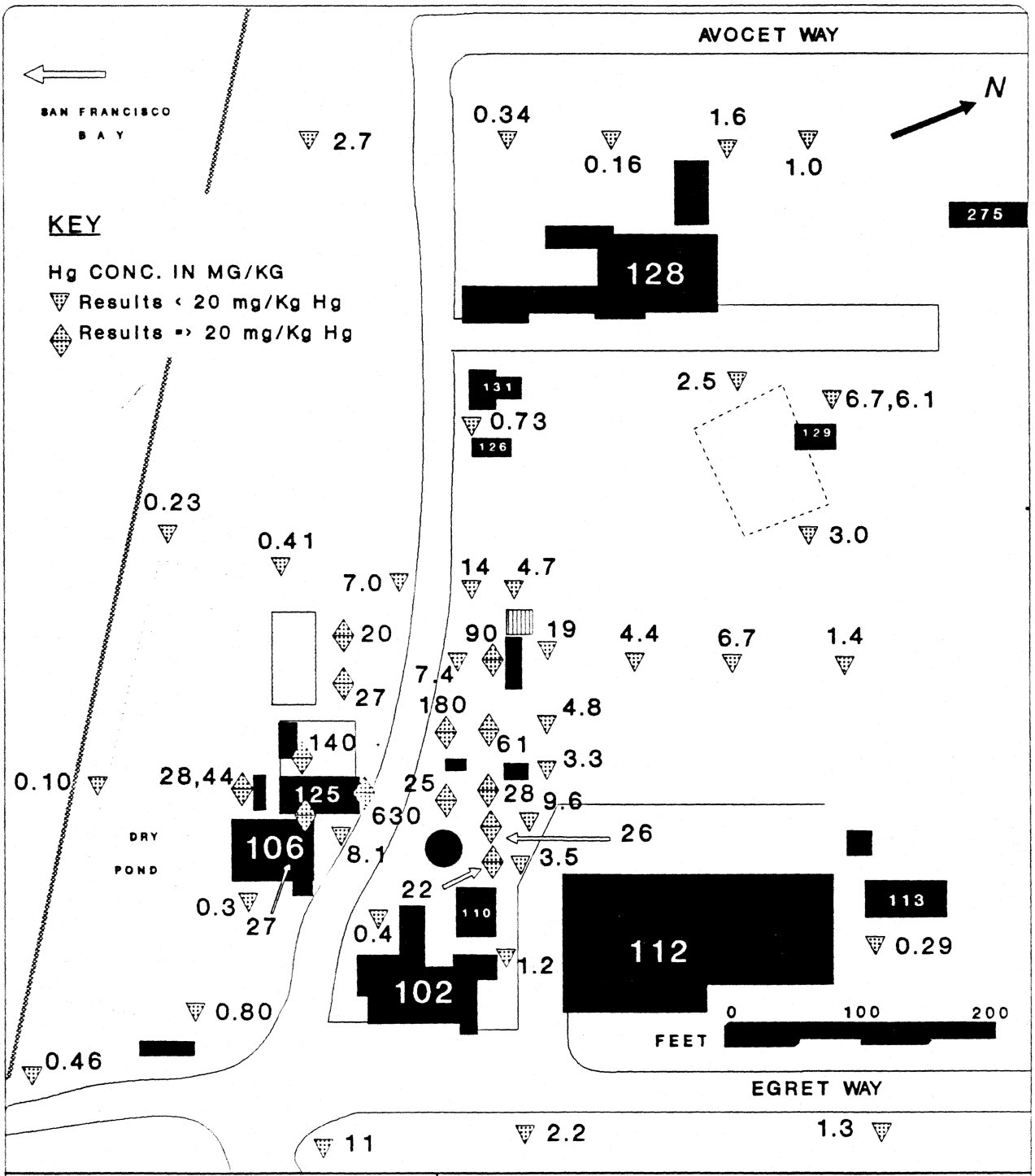

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FIGURE 3-3
MERCURY IN SOIL AT THE STUDY AREA, 0-3 FEET
(J&A, 1989-90)

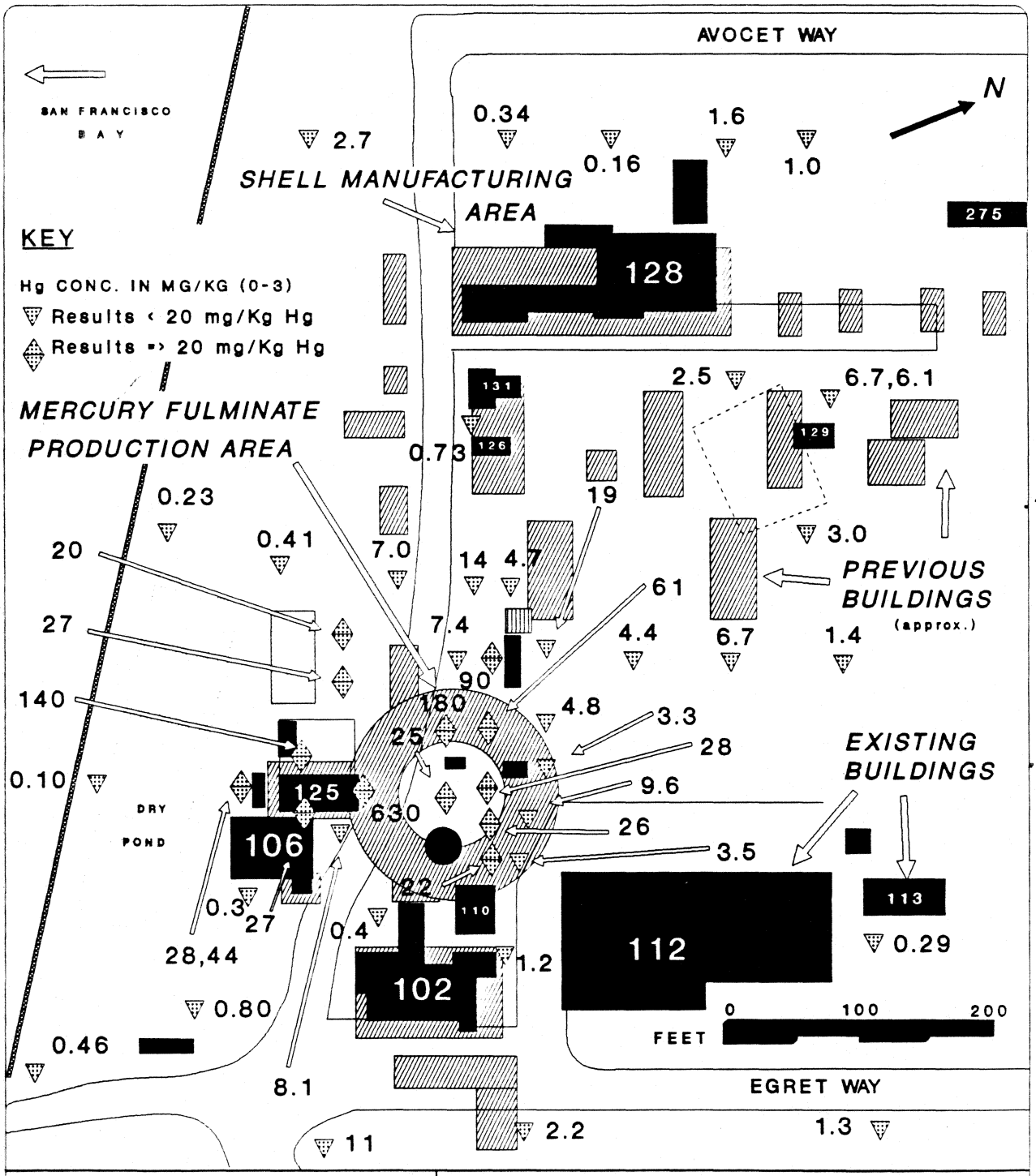

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FIGURE 3-4
PAST AND PRESENT STRUCTURES AND SOIL MERCURY CONCENTRATION
(J&A, 1989-90)

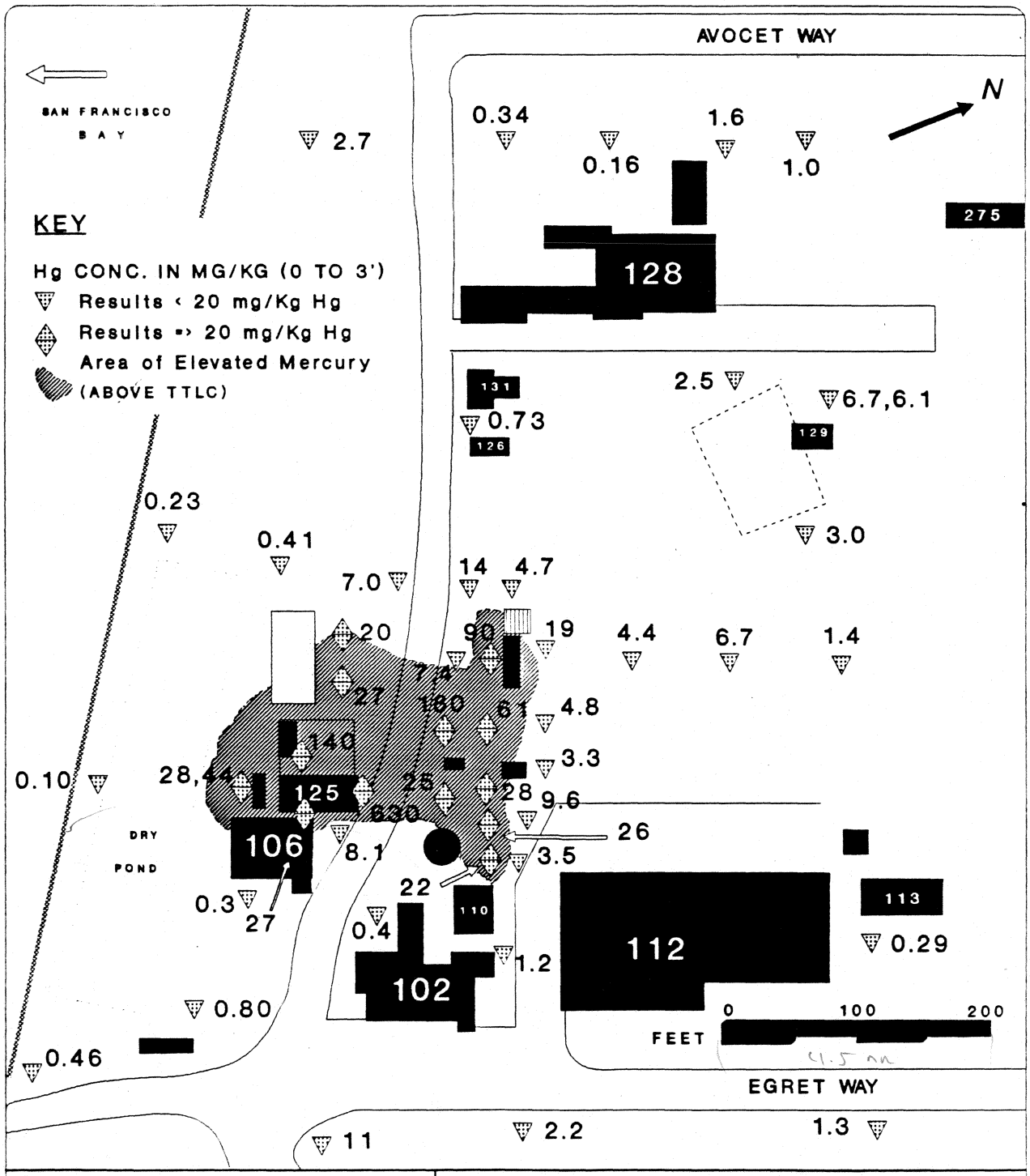

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FIGURE 3-5
ELEVATED MERCURY LEVELS IN SOIL,0-3 FEET
(J&A, 1989-90)

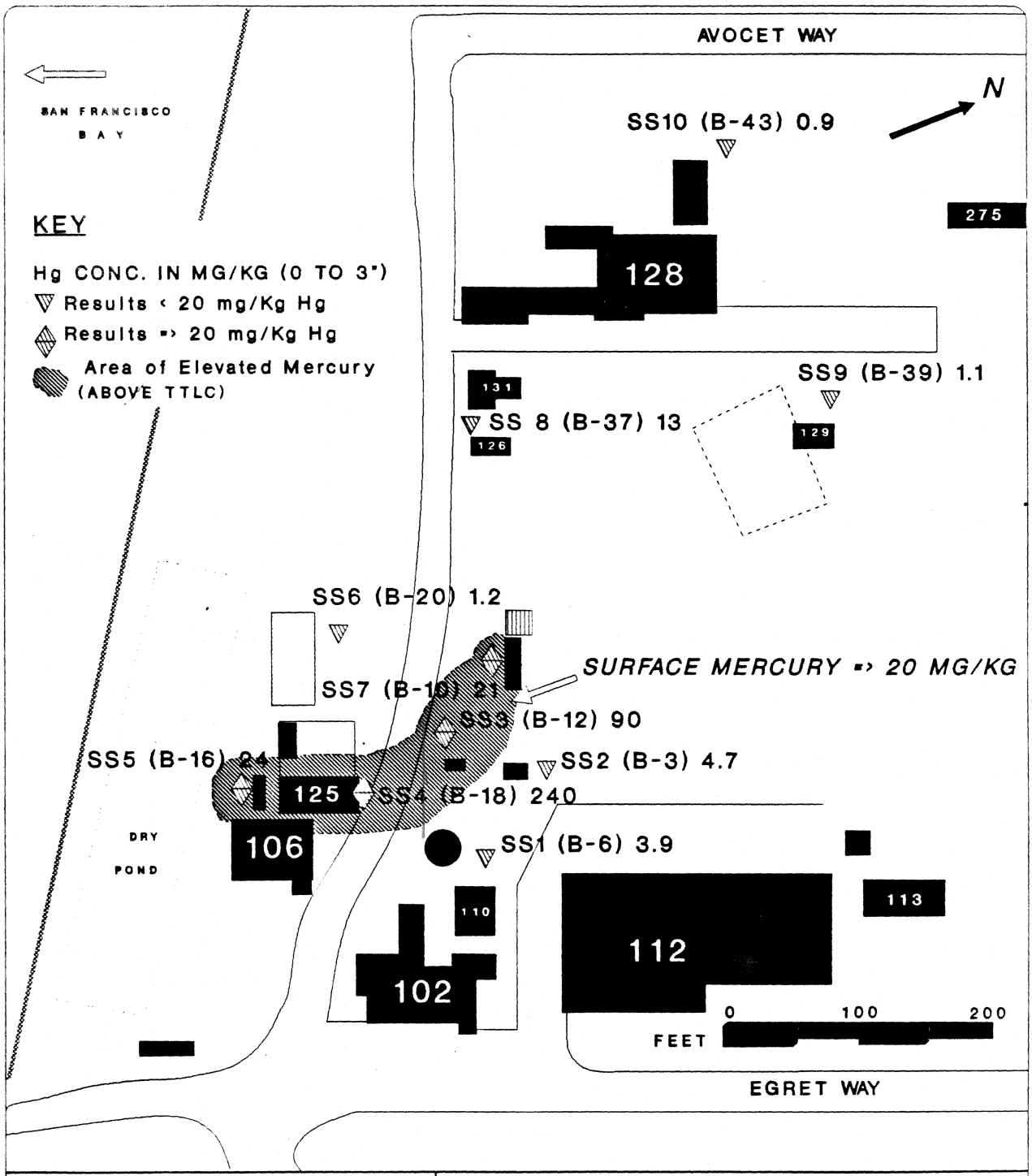

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FIGURE 3-6
ELEVATED MERCURY LEVELS IN SURFACE SOIL
(J&A,1989-90)

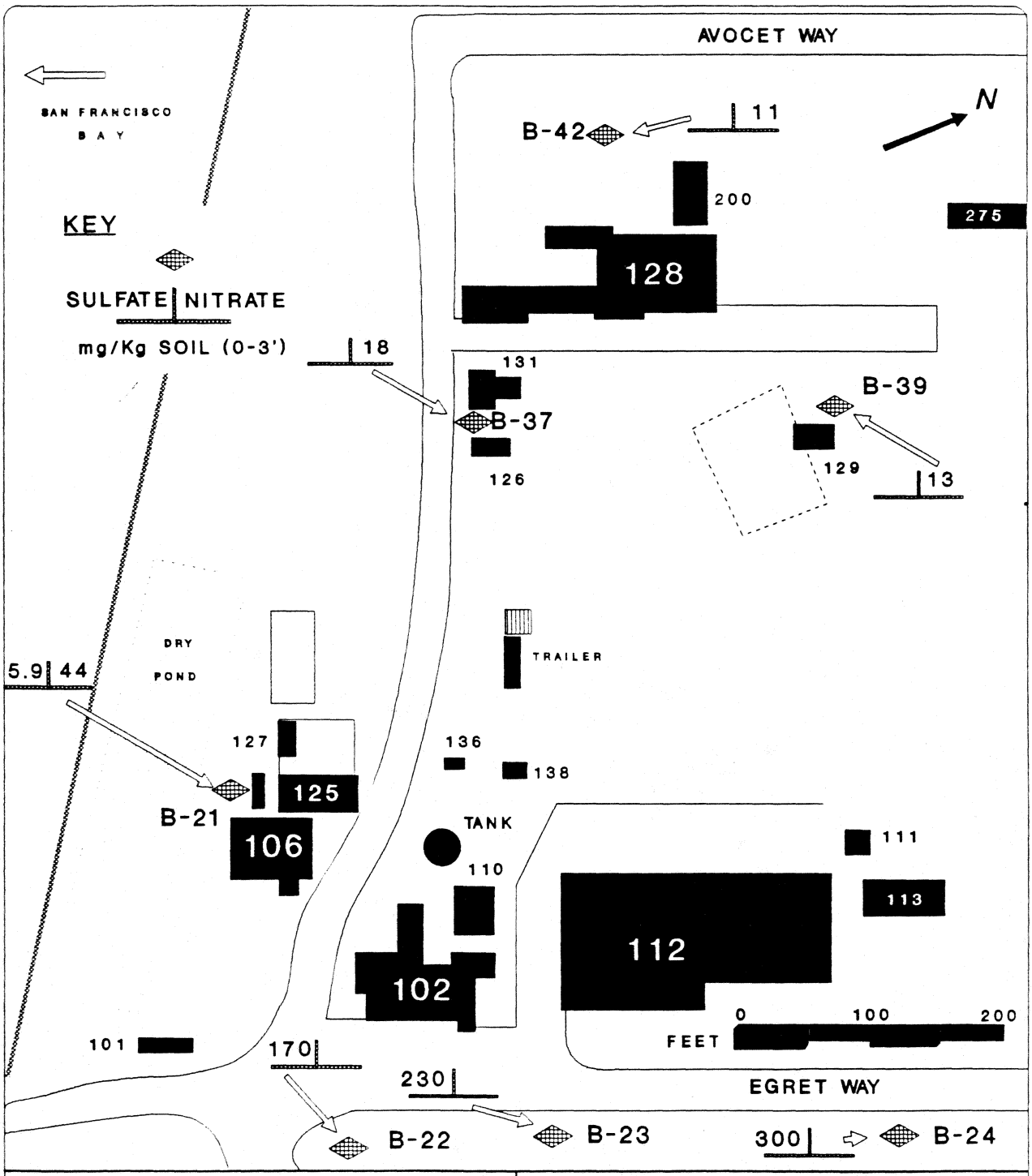

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FIGURE 3-7

SULFATE & NITRATE IN SOIL 0 TO 3 FEET
(J&A, 1989-90)

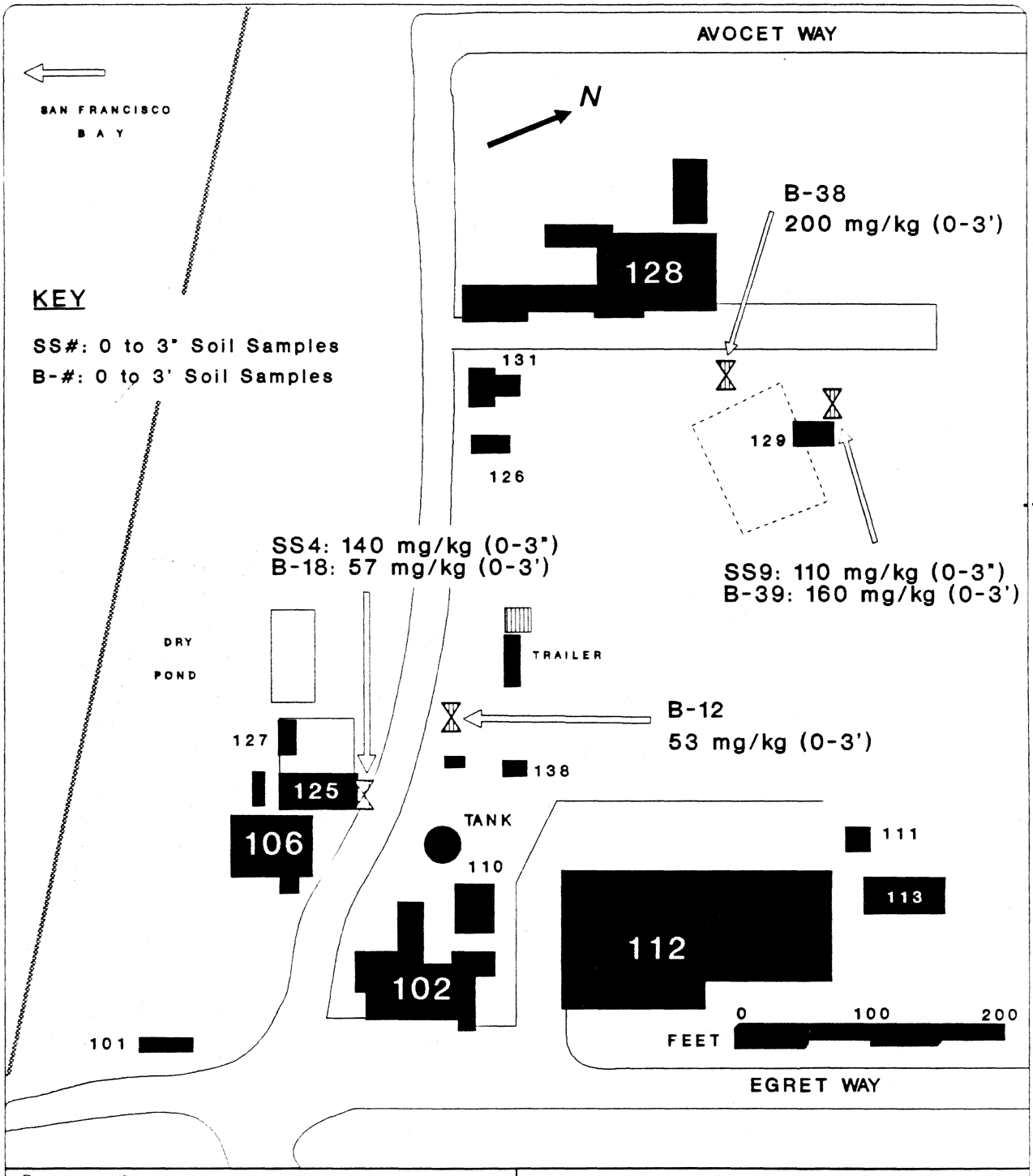

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FIGURE 3-8

COPPER IN SURFACE SOIL AND AT 0-3 FEET

(J&A,1989-90)

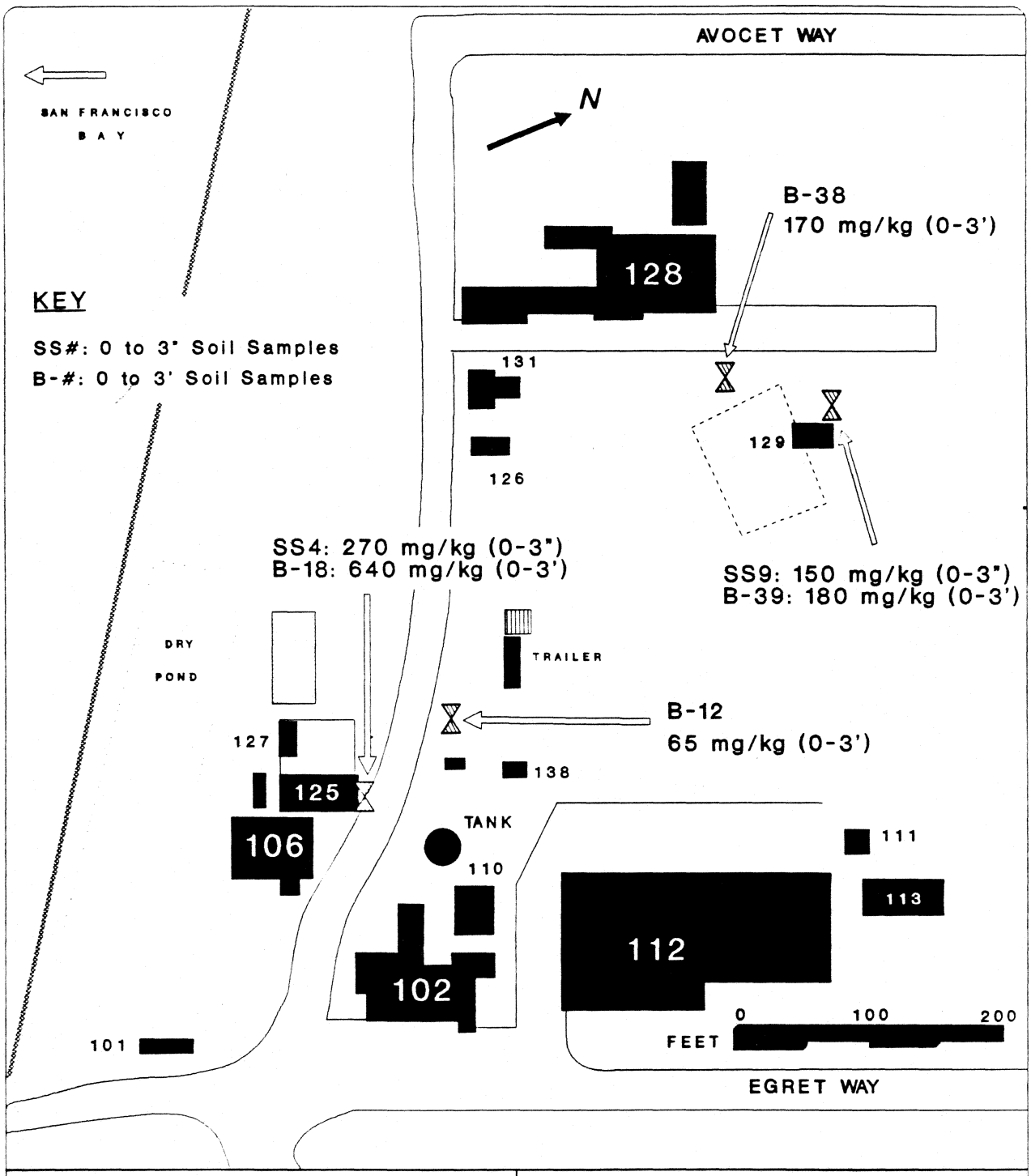

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FIGURE 3-9
ZINC IN SURFACE SOIL AND AT 0-3 FEET
(J&A, 1989-90)

Table 3 - 3

MERCURY IN SURFACE SOIL
RICHMOND FIELD STATION
(J & A, 1990)

SAMPLE (BOREHOLE)	MERCURY mg/kg	SAMPLE (BOREHOLE)	MERCURY mg/kg
SS2(B3)	4.7	SS1(B6)	3.9
SS7(B10)	21	SS3(B12)	90
SS5(B16)	24	SS4(B18)	240
SS6(B20)	1.2	SS8(B37)	13
SS9(B39)	1.1	SS10(B43)	0.92

As seen in Figure 3-3, mercury concentrations ranged from 0.1 mg/kg to 630 mg/kg. The highest concentrations were located in the general area of Building 125 and Building 110. The lowest concentrations were in the area of the south-southwestern fence line and at Building 128. Three samples collected along this fence line (B-22, B-23 and B-24) ranged from 0.10 mg/kg to 0.46 mg/kg, with an average concentration of 0.26 mg/kg mercury. The seven borehole samples collected around Building 128 (B-38, B-39, B-41 through B-45) ranged from 0.16 mg/kg to 6.7 mg/kg, with an average concentration of 1.86 mg/kg mercury. Six samples (B-24, B-28, B-32, B-39 and B-44) defined the northern extent of sampling for mercury in soil. Results from these samples ranged from 0.29 mg/kg to 6.7 mg/kg.

Figure 3-4 presents the soil mercury results superimposed on the former mercury fulminate production area. As seen in this figure, high concentrations of mercury are located in this previous production area. Outside of this mercury production area, twenty borehole composite samples ranged in concentrations from 0.1 mg/kg to 6.7 mg/kg, with an average concentration of 2.3 mg/kg mercury. From this analysis there appears to be a very strong correlation between previous activities in the mercury fulminate production area and concentrations of mercury in shallow soil. Figure 3-5 shows that the main body of mercury in soil is localized in the area of the former mercury fulminate facility.

Duplicate samples were collected and analyzed. Samples B-16 and B-21 were collected from the same borehole. Mercury in these samples was, 28 mg/kg and 44 mg/kg, respectively. Samples B-39 and B-45 were also collected from the same borehole. Mercury in these samples was 6.7 mg/kg and 6.1 mg/kg, respectively. The differences in results between duplicate samples is probably due to a natural variation of mercury adsorption in the soil.

Results from sampling of the surface soil (0 - 3 inches) are presented in Table 3-3 and on Figure 3-6. As presented in Figure 3-6, mercury concentrations above 20 mg/kg are fairly localized in the area of the former mercury fulminate production facility.

During drilling of the monitoring well MW-1, 18 soil samples were collected from 2.5 to 11.5 feet and 14 to 15 feet depths. Four composite samples (2.5 - 9 feet) were analyzed for mercury. Mercury was detected in all four samples at a concentration range of 2.7 to 36 mg/kg. Discrete soil samples from 10.5 to 11.5 feet and 14 to 15 feet were collected for lithologic description only. These samples were not submitted to the laboratory for analysis.

3.2.2 Results of Analyses for Sulfate and Nitrate in Soil Samples

As Table 3-4 indicates, four composite soil samples (0 - 3 feet) were analyzed for sulfate and nitrate. The sample locations are shown in Figure 3-7. Concentrations of sulfate (SO_4^{-2}) sampled east of Egret Way ranged from 170 mg/kg to 300 mg/kg and were collected from three boreholes. Another sample, collected behind Building 125, contained 5.9 mg/kg sulfate.

Table 3 - 4

SULFATE & NITRATE IN 0 - 3 FEET OF SOIL
RICHMOND FIELD STATION
(J & A, 1990)

COMPOSITE SAMPLE[a]	SULFATE mg/kg	COMPOSITE SAMPLE	NITRATE mg/kg
B21	5.9	B21	44
B22	170	B37	18
B23	230	B39	13
B24	300	B42	11

a. Composite samples are identified by borehole numbers.

Three samples collected near Building 128 and one within the location of the former mercury fulminate facility were analyzed for nitrate (NO_3^-). Nitrate in the samples collected near building 128 ranged in concentration from 11 to 18 mg/kg (Figure 3-7). The sample collected within the former mercury fulminate facility contained 44 mg/kg of nitrate. Currently, it is unknown whether the nitrate found represents a free radical of nitroglycerin ($C_3H_5(ONO_2)_3$, mercury fulminate ($C_2N_2O_2Hg$), or is from another source (garden fertilizer or previous sewage activity).

3.2.3 Results of Analyses for Copper and Zinc in Soil Samples

Table 3-5 and Figures 3-8 and 3-9 present the sample locations and analytical results for copper and zinc concentrations in composite samples B-12, B-18, B-38 and B-39. In addition, two surface samples were collected adjacent to the sample locations for B-18 and B-39. All samples were below the TTLC level of 2,500 ppm for copper, and 5,000 ppm for zinc.

Table 3 - 5

COPPER AND ZINC IN 0 - 3 FEET OF SOIL
RICHMOND FIELD STATION
(J & A, 1990)

COMPOSITE SAMPLE	COPPER (TTLC:2,500) mg/kg	COMPOSITE SAMPLE	ZINC (TTLC:5,000) mg/kg
B12	53	B12	65
B18	57	B18	640
B38	200	B38	170
B39	160	B39	180

COPPER AND ZINC IN SURFACE SOIL
RICHMOND FIELD STATION
(J & A, 1990)

SAMPLE (BOREHOLE)	COPPER (TTLC:2,500) mg/kg	SAMPLE (BOREHOLE)	ZINC (TTLC:5,000) mg/kg
SS4(B18)	140	SS4(B18)	270
SS9(B39)	110	SS9(B39)	150

3.2.4 Results of EP Toxicity and Waste Extraction (WET) Tests for Mercury in Soil Samples.

In order to determine whether levels of mercury in soil exceeded the designated federal hazardous waste level (0.2 mg/l), an EP Toxicity Extraction (EPA 3020/7470) was preformed on the composite soil sample, B-21. The sample had originally shown 44 mg/kg of total mercury in soil. Results from EP Toxicity Extraction indicated that mercury in the extracted sample was not present above the detection limit of 0.01 mg/l.

In addition to this analysis, the State's Waste Extraction Test (Wet) was performed on the composite sample from borehole B-18 in order to determine whether levels of mercury in soil exceeded the State-designated hazardous waste level (0.2 mg/l). A mercury concentration of 1.3 mg/l was detected in the extracted waste. The results of the WET test indicate that mercury is present in these soils could potentially (under acidic conditions) leach out of soil at concentrations equal to or greater than 0.2 mg/l.

4.0 GROUNDWATER MONITORING WELL DRILLING, CONSTRUCTION, DEVELOPMENT, SAMPLING, AND ANALYSIS

To characterize the vertical stratigraphy and water table and to determine the presence or absence of mercury in groundwater at RFS, an additional groundwater monitoring well (MW-1) was installed downgradient from the former mercury fulminate facility by Aqua Science Engineers Inc. Figure 4-1 presents the well construction details of the monitoring well, MW-1. Figure 4-2 identifies the general lithologies encountered at the location of MW-1 and the results from the soil sample analysis.

A previous groundwater monitoring well was installed by Aqua Science Engineers on March 7, 1988 as part of an underground fuel storage tank investigation. Groundwater sample collected from this well showed no contaminant of concern. The location of this well is shown in Figure 2-2. This well is located upgradient from the former mercury fulminate facility. It will be considered an upgradient background well for this and all future investigations and will be referred to as MW-A. The well log description of MW-A is presented in Figure 4-3.

The methods and procedures for drilling, construction, development, and sampling of monitoring well MW-1 (installed pursuant to Phase I) are described in this section. Details regarding sample collection procedures, analysis, and analytical results are also included.

4.1 DRILLING METHODS

The soil boring for the monitoring well was drilled utilizing a hollow-stem auger. Hollow-stem auger drilling is accomplished through use of a hollow central shaft with an attached spiral scroll. Each section of auger is aligned so that a continuous scroll is formed. A bit is attached at the bottom of the first auger flight. Cuttings created by the bit are removed by the scroll as the auger stem is turned. This method is suitable for relatively shallow drilling in unconsolidated formations. A soil boring 13 feet deep was drilled with an auger rig utilizing an eight-inch outside diameter hollow-stem auger. This boring was completed as a monitoring well. The spoil was collected in drums and set aside for appropriate disposal.

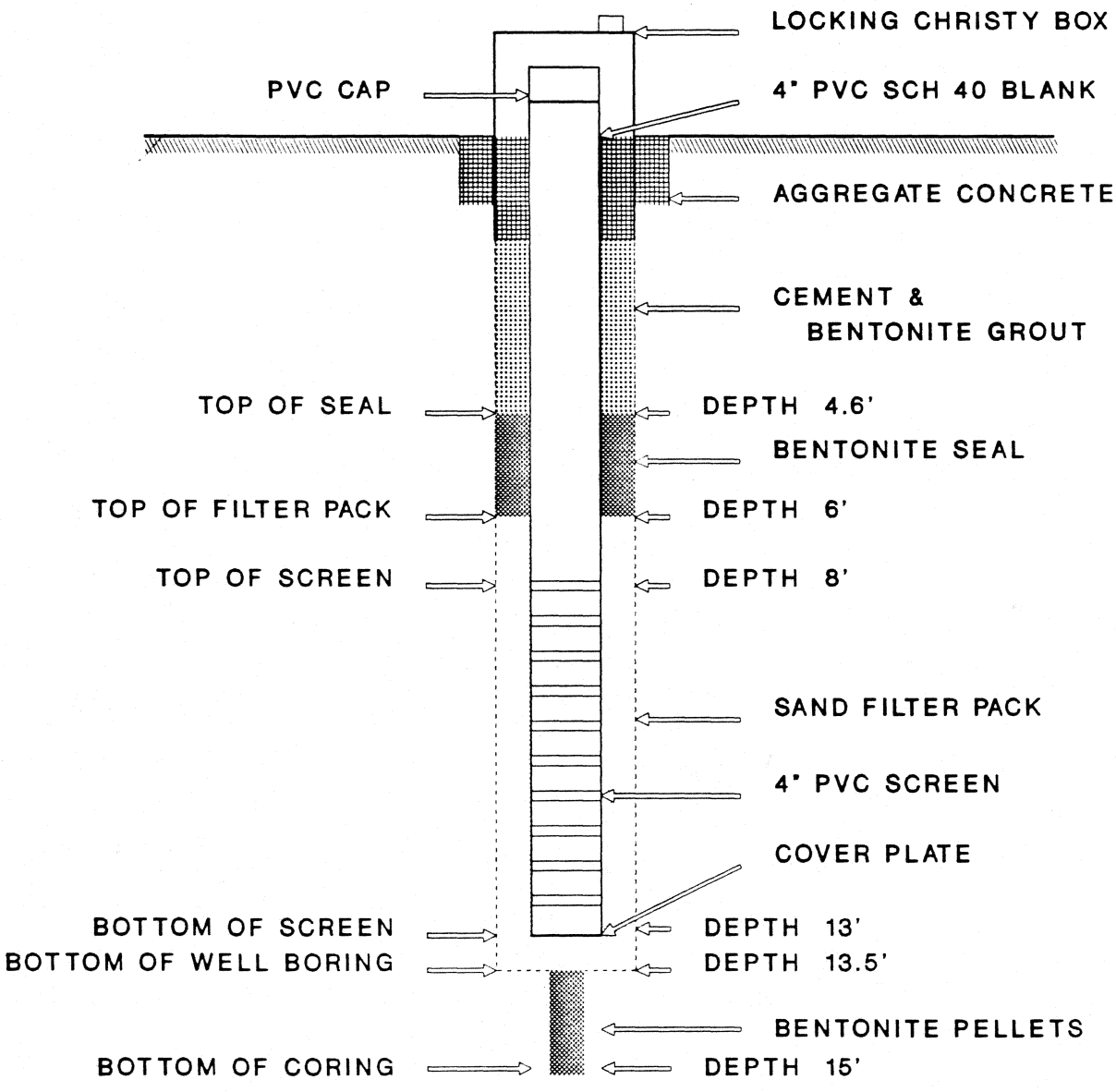
Soil samples for lithologic description and chemical analysis were collected every foot, utilizing a split-barrel drive sampler. A total of 18 discrete soil samples were collected from 2.5 feet to 11.5 feet and from 14 to 15 feet. Soil samples were collected in brass tubes, labeled and placed in plastic bags. Samples were then placed into an insulated cooler for shipment to the laboratory, maintaining them at approximately 4° Celsius.

JONAS AND ASSOCIATES INC.

WELL No.: MW1
PROJECT No.: UCRFS-101

Figure 4-1 MW-1 CONSTRUCTION DETAILS

PROJECT NAME: UNIVERSITY OF CALIFORNIA RICHMOND FIELD STATION
BORING LOCATION: Behind Building 105 DATE: 2-25-90 BY: RJ



NOT TO SCALE

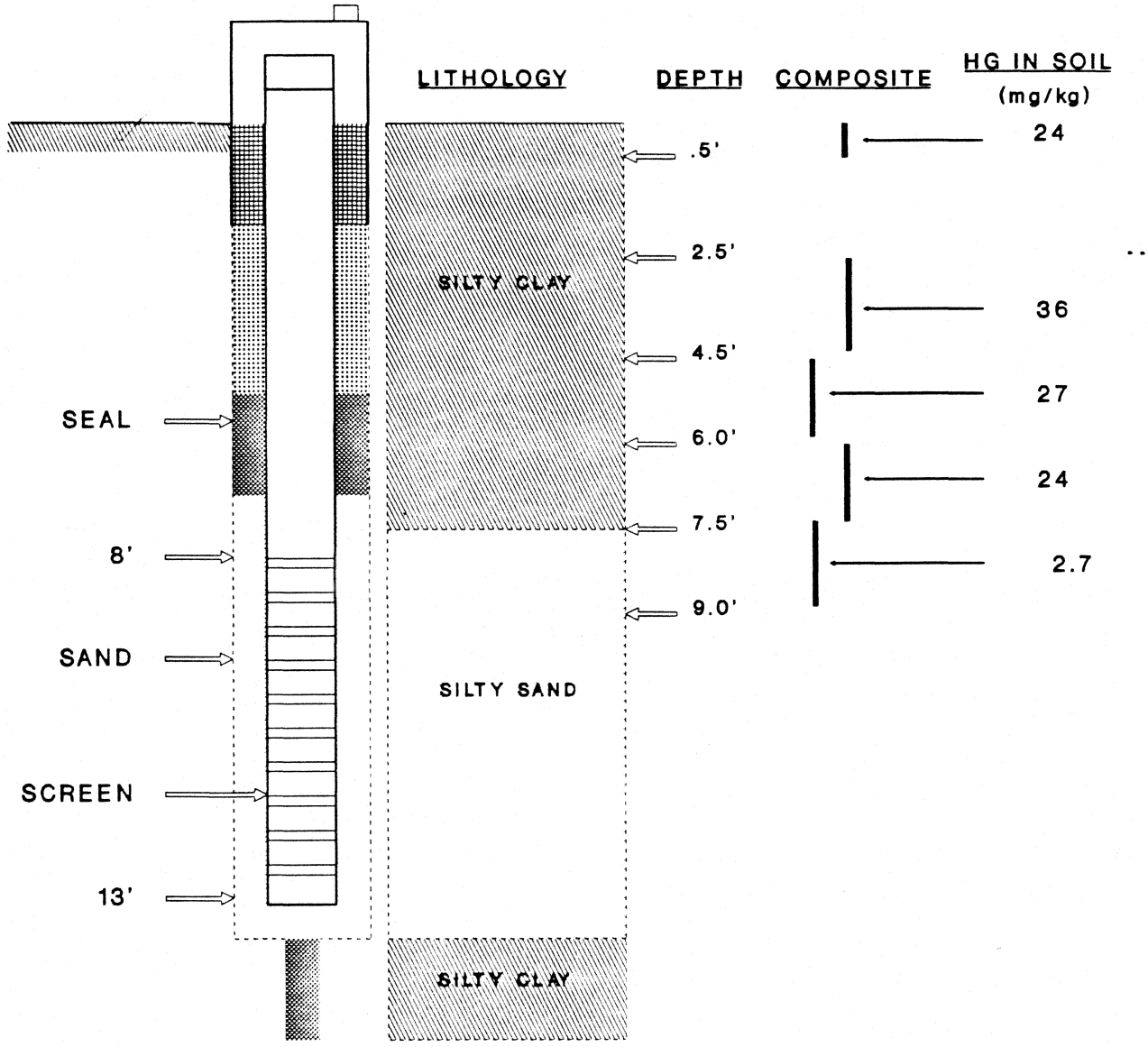
JONAS AND ASSOCIATES INC.

Figure 4-2

WELL No.: MW1
PROJECT No.: UCRFS-101

MW-1 STRATIGRAPHY AND SOIL ANALYTICAL RESULTS

PROJECT NAME: UNIVERSITY OF CALIFORNIA RICHMOND FIELD STATION
BORING LOCATION: Behind Building 105 DATE: 2-25-90 BY: RJ



NOT TO SCALE

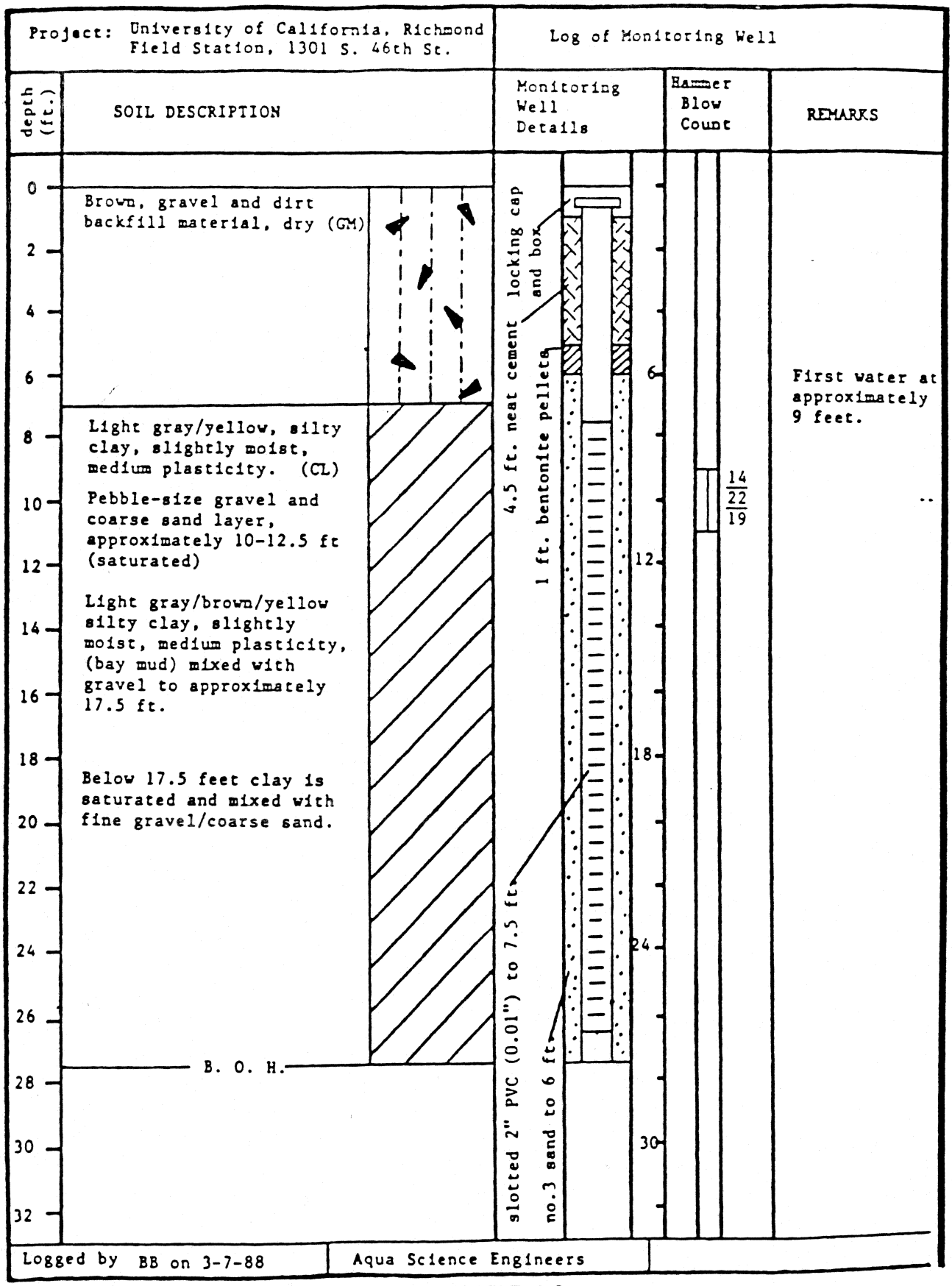


FIGURE 4-3

MW-A CONSTRUCTION DETAILS

Upon receipt by the laboratory, one composite sample was prepared per depth ranges specified on the plastic bag. Four composite samples from 2.5 - 4.5 feet, 5 - 6 feet, 6.5 - 7.5 feet, 8 - 9 feet were analyzed for total mercury (EPA Method 7471). Details on sample collection and analysis are provided in Section 3 of this report.

4.2 WELL CONSTRUCTION

The groundwater monitoring well MW-1 was completed with a 5-foot long PVC screen, with a 0.01-inch slot size. The screen was connected to a 10-foot long PVC riser pipe. All joints were flush threaded and no solvents or cements were used on the PVC. The pipe and screen were steam-cleaned before use. The screen penetrates the complete thickness of the aquifer.

A filter pack consisting of three-inch silica sand was placed in the annular space at the well screen and carried 2 feet above the top of the screen. A bentonite seal, one-half foot thick and composed of one-half inch pellets, was placed above the sand pack and the remaining annular space was filled with a neat cement-bentonite grout. Frequent measurements with a steel tape were made during placement of materials to ensure that proper amounts of material were placed and that seals were properly located to avoid cross-contamination. The grout used to finish the well consisted of neat Portland cement modified with sodium bentonite to reduce shrinkage. The ratio of cement to bentonite was approximately 20:1 on a weight basis. Water and then bentonite were added to the Portland cement.

The well head was completed approximately 1 foot above the grade. A three-foot protective metal casing that extends 1.7 feet below grade and 1.3 feet above grade was placed over the 1-foot riser. The metal casing includes a hinged steel lid with provision for a padlock.

When constructing the well, maximum effort was made to avoid contamination of the well construction materials. The PVC construction materials were procured clean from the fabricators. The following procedures were followed to prevent contamination:

- All screen and casings were steam-cleaned before installation;
- All filter-pack material was placed directly from the bag (spilled material was not to be taken from the ground and placed in the boring); and
- The steel tape used to sound for depth during installation was steam-cleaned between borings.

Additional precautions taken during well construction included:

- Ensuring that no foreign material entered the well casing during construction;

- o Making frequent soundings when placing the filter pack, bentonite, and grout into the annular space;
- o Noting the total casing length in the borehole, the stickup, and the casing cutoff so that the total depth could be accurately calculated (i.e.: {(total casing length)-(stickup+cutoff)}=depth); and
- o Recording all final measurements, problems, and comments in the field log book.

4.3 WELL DEVELOPMENT

When well construction was complete and the grout column was cured for a minimum of 24 hours, well development was performed with a submersible pump. Well development was initiated by lowering a submersible pump into the well. The pump was connected directly to an outlet in one of the buildings nearest to the monitoring well. The pump was placed one foot above the bottom of the well. Approximately five well volumes were removed during development. Well volume was calculated using the formula:

$$V = Pi(h/4)\ \{D_{c2}(1-n)+nD_{p2}\}$$

where V = volume of standing water in well, ft^3
Pi = 3.14
D_p = diameter of filter pack, ft
D_c = diameter of well casing, ft
n = porosity of the filter pack, decimal fraction
h = height of standing water in well, ft

The variable h was determined by subtracting the depth to water from the total well depth. The value n was 0.3. To convert the well volume to gallons, V was multiplied by 7.48. Water level and well depth were measured with an electric sounding device.

The monitoring well was pumped until the discharge was clear, colorless, and free of particulates. Water from equipment steam-cleaning and development were stored in 55-gallon drums.

4.4 SAMPLE COLLECTION PROCEDURES AND ANALYSIS

Upon the completion of well development, a teflon bailer was used to collect the sample. First, the teflon bailer was rinsed five-times with well water. Then the sample was directly poured from the bailer into a one-liter plastic sample bottle provided by Curtis & Tompkins laboratory. The bailer was decontaminated prior to and after sample collection. The sample bottle was sealed, labeled and kept at 4°C in an ice chest until transferred to the laboratory. The sample was filtered and preserved by the

laboratory upon receipt. The groundwater sample collected was analyzed for mercury (EPA Method 7470) and TDS (EPA Method 160.1).

4.5 RESULTS OF ANALYSES FOR MERCURY AND TOTAL DISSOLVED SOLIDS (TDS) IN WATER SAMPLE

Figure 4-4 presents the location of monitoring well MW-1 within the former mercury fulminate facility. MW-1 is located approximately 60 feet downgradient of the highest mercury concentration measured in soil (630 mg/kg in composite sample, B-18).

Mercury was not detected above the instrument detection limit of 0.001 mg/l in the groundwater sample. TDS was measured at 1,300 ppm in groundwater. Mercury was encountered in the soil to a depth of nine feet below the surface, as shown in Figure 4-2. The transmissive zone of silty sand, which was eventually screened for monitoring well MW-1, showed a mercury concentration in soil of 2.7 mg/kg. Concentrations above that zone were generally an order of magnitude higher.

The results of the groundwater sample analysis indicate that the mercury in the soil could be effectively bound and may not be releasing into groundwater. From a water quality perspective this is very encouraging, since mercury fulminate has been at this location for over forty years and it might be expected to be present in the groundwater. However, based on the groundwater analysis, no mercury was detected. This may be due to the insoluble property of mercury fulminate, as well as the presence of a thick clay layer (0 - 7.5 feet) that provides an organic environment for mercury to effectively bind with the organic fraction of the silts and clay. Additional groundwater samples will be collected as part of Phase II of the mercury investigation to augment the preliminary findings of Phase I.

5.0 THE CHEMISTRY, TOXICOLOGY, AND MIGRATION PATHWAYS OF MERCURY AND MERCURY FULMINATE

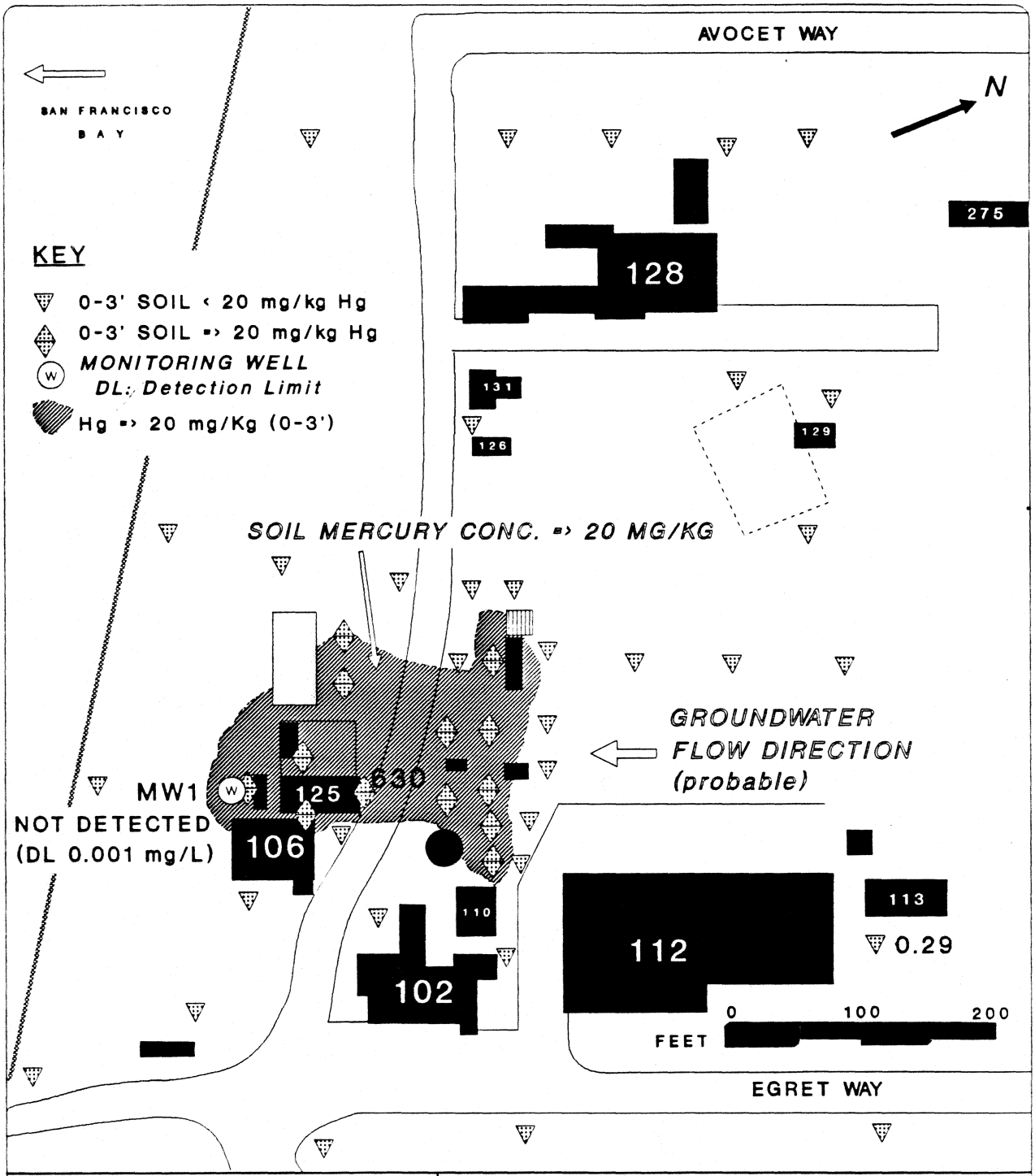
The discussion presented in this section is based on a general literature search. A public health and environmental risk assessment is proposed for phase II of the mercury investigation, at which time a thorough evaluation will be performed.

5.1 CHEMISTRY OF MERCURY AND MERCURY FULMINATE

5.1.1 Chemistry of Mercury

Mercury has an atomic weight of 200.59. At 20°C , its specific gravity is 13.546 and its vapor pressure is 0.0012 torr. The solubility of metallic mercury in pure water has been determined by Sanemasa (1975) to be 0.019 mg/l and 0.081 mg/l at 5°C and 30°C, respectively.

Under the usual conditions of temperature and pressure that occur in the environment, mercury can be present in any one of three different oxidation states. The most reduced form is the metal, which is a liquid at ordinary temperatures and which has a tendency to vaporize. The other two forms are the mercurous ion, Hg^{+1}, and the



Prepared for

UNIVERSITY OF CALIFORNIA

Richmond Field Station

Prepared by

JONAS & ASSOCIATES

FIGURE 4-4

MW-1, PROBABLE GROUNDWATER FLOW, AND ELEVATED SOIL MERCURY

(J&A, 1989-90)

mercuric ion Hg^{+2}. Mercury can build many species. Some complex ions have considerable aqueous solubility, while others are relatively insoluble. Mercury also forms many stable organic complexes. Within a moderately oxidizing environment above pH 5, the predominant mercury species will be elemental mercury. Mildly reducing conditions can cause mercury to precipitate as a sulfate (cinnabar). Cinnabar has an extremely low aqueous solubility. In aquatic environments that are high in chloride, the solubility of mercury in oxygenated solutions may be greatly increased by the formation of mercuric chloride complexes (Garvis and Ferguson, 1972).

Equally important are the processes which produce the organic complexes of mercury. Two types of alkylated mercury compounds are formed in the environment:

- o Compounds with a single carbon-mercury bonds that act as substituted salts which are reasonably water-soluble.
  - An example is methyl mercuric chloride (CH_3HgCl), which becomes CH_3Hg^+ ion and Cl^- in solution.

- o Compounds with two carbon atoms attached to the mercury. These covalent mercury compounds are generally quite insoluble.
  - An example is dimethyl mercury (CH_3HgCH_3) which is volatile and is undisassociated in solution. Inorganic forms of mercury can be converted to organic forms by microbial action.

5.1.2 Mercury Fulminate

Mercury fulminate {Hg-$(ONC)_2$ or $C_2N_2O_2Hg$} has a molecular weight of 284.6 and a density of 4.42 g/cm^3. Its percentage of nitrogen is 9.84%. It is a crystal at standard temperatures and pressure. Its heat of explosion is 355 Kilocalorie per kilogram (kcal/kg) or 1486 kilojoule per kilogram (kj/kg). Mercury fulminates deflagration point is 165°C or 330°F and its impact sensitivity is 1-2 newton meter (N m).

Mercury fulminate is practically insoluble in water. When dry, it is highly sensitive to shock, impact, and friction, and is easily detonated by sparks and flames.

Mercury fulminate is prepared by dissolving mercury in nitric acid, after which the solution is poured into 95% ethanol. After a short while, a vigorous gas evolution takes place and crystals are formed. When the reaction has ended, the crystals are filtered by suction and washed until neutral. The mercury fulminate product is obtained as small, brown-to grey pyramid-shaped crystals; the color is caused by the presence of colloidal mercury. Owing to its excellent priming power, its high brisance, and to the fact that it can easily be detonated, mercury fulminate was the initial explosive most frequently used prior to the appearance of lead azide. It was used in compressed form in the manufacture of blasting caps and percussion caps. Mercury fulminate is stored under water.

5.2 FATE AND TRANSPORT OF MERCURY

Mercury and certain of its compounds can volatilize to the atmosphere from aquatic and terrestrial sources. In the atmosphere complex species of mercury commonly form. Precipitation is the primary mechanism for removal of mercury from the atmosphere. But photolysis can also breakdown airborne mercurials. Adsorption onto suspended and bottom sediments is commonly the fate of mercury in the aquatic environment. Sorption is strongest on organic materials. Mercury in soils generally complexes to organic compounds.

Virtually all mercury compounds can be remobilized by microbial conversion to methyl and dimethyl forms. Conditions reported to enhance biomethylation include large amounts of available mercury, large numbers of bacteria, the absence of strong complexing agents, near neutral pH, high temperatures, and moderately aerobic environments. Mercury is also strongly bioaccumulated by numerous mechanisms. Methylmercury is the most readily accumulated form of mercury in aquatic biota.

5.2.1 Volatilization

Metallic mercury has a relatively high vapor pressure relative to other metals and commonly enters the atmosphere as several different gaseous compounds. The rate of vaporization of mercury and certain of its inorganic compounds decreases in the sequence Hg > Hg_2Cl_2 > $HgCl_2$ > HgS > HgO, according to Koksay and Bradshaw (1969). The microbial methylation of mercury also enhances evaporation of mercury.

5.2.2 Sorption

Mercury has an affinity for many surfaces. In water samples a major portion of the total mercury is found associated with particulate matter (Hinkle and Learned, 1969). Ramamoorthy and Rust (1976) found that sorption rates are highest in organic-rich soils, with sediment binding capacity closely related to organic content. They also found that desorption rates are low: less than one percent Hg leached from sediments after 70 hours of agitation in distilled water.

5.2.3 Biotransformation

Mercury does take part in biological reactions which alter its mobility and toxicity. Bisogni and Lawrence (1975) evaluated the influences of inorganic mercury concentrations and speciation, pH, microbial activity, and redox potential on mercury methylation rates. They found that in a neutral pH the primary product of mercury methylation is methyl mercury. Methylation can occur under both aerobic and anaerobic conditions. More mercury methylation occurs when high number of bacteria are present. Therefore, highly organic sediments which favor bacterial growth have a higher methylation potential than inorganic sediments. Upon entering an aqueous system, mercurial compounds will tend to convert to methylmercury through microbial chemical transformation.

5.3 TOXICOLOGY OF MERCURY

Mercury occurs as elemental mercury and as inorganic and organic compounds (mercury vapor, mercury liquid, mercury salts, short-chain alkylmercury compounds, alkoxyalkylmercury compounds and phenylmercury compounds), all having different toxicological properties.

Mercury is circulated naturally in the biosphere, 30,000 - 150,000 tons being released into the atmosphere by degassing from the earth's crust and the oceans. In addition, 20,000 tons of mercury are released into the environment each year by human activities such as combustion of fossil fuels and other industrial release. Yearly, 10,000 tons of mercury are produced for industrial use, a small part of which is used for synthesizing organic mercury compounds.

In nature, methylmercury is produced from inorganic mercury as a consequence of microbial activity. In fish, the major amount of mercury is methylmercury. Factors determining the methylmercury concentration in fish are: mercury content in water and bottom sediment; pH and redox potential of water; and species, age, and size of fish.

The toxic properties of mercury vapor are due to mercury accumulation in the brain causing neurological signs, involving an unspecific psychoasthenic and vegetative syndrome (micromercurialism). At high exposure levels mercurial tremor is seen, accompanied by severe behavioral and personality changes, increased excitability, loss of memory and insomnia. On a group basis, exposure levels are likely to be reflected in mercury concentrations in blood and urine. Occupational exposure to mercury concentrations in air above 0.1 milligram per cubic meter (mg/m^3) may produce mercurialism. Micromercurialism has not been reported at concentrations below 0.01 mg/m^3.

The acute and long-term action of mercuric salts, phenylmercury compounds and alkoxyalkylmercury compounds is likely to be gastrointestinal disturbance and renal damage - appearing as a tubular dysfunction with tubular necrosis in severe cases. The lethal dose in human is about 1 gram of mercuric salt. The mercury load on the kidney is best determined by analysis of renal biopsy. Mercury concentrations in the kidney between 10 and 70 mg/kg have been reported in poison cases involving renal injury. Levels below 3 mg/kg may be found in normal cases. Occasionally, mercuric compounds may cause idiosyncratic skin symptoms that may develop into severe exfoliative dermatitis or may cause glomerular nephritis. A specific form of idiosyncrasy, called acrodynia or pink disease, is seen in children. Most cases are associated with mercury exposure showing increased levels of mercury in urine.

The hazards involved in long-term intake of food containing methylmercury and in occupational exposure to methylmercury are due to the efficient absorption (90%) of methylmercury in man and the long retention-time (half-time 70 days) with accumulation of methylmercury in the brain. Chronic poisoning results in degeneration and atrophy of the sensory cerebral cortex, paresthesia, ataxia, hearing

and visual impairment. Prenatal exposure causes cerebral palsy and in less severe cases, psychomotor retardation. Methylmercury concentration in blood and hair reflects the body burden and the concentration in brain of methylmercury. Intake resulting in body burdens of less than 0.5 mg/kg body weight is not likely to give rise to detectable neurological signs in adults. This intake corresponds to blood values of less than 200 ug/l and mercury level in hair less than 50 mg/kg. However, this level of methylmercury exposure in pregnant females may result in inhibited brain development of fetus with psychomotor retardation of the child as a consequence. The highest level of methylmercury load in pregnant women, not associated with inhibition of fetal brain development, is not known.

The history of mercury toxicology has been reviewed by Goldwater (1964), the pharmacology and toxicology by Clarkson et al. (1972), the chemistry of mercury in biological systems by Carty and Malone (1979), the toxicology of methylmercury by a Swedish Expert Group (1971), and the toxicology and epidemiology by Friberg and Vostal (1972), by the Task Group on Metal Accumulation (1973), the Task Group on Metal Toxicity (1976), and by the WHO (1976,1980).

6.0 SUMMARY AND RECOMMENDATIONS

6.1 SUMMARY OF THE INVESTIGATION

UC has initiated a comprehensive investigation of potential mercury contamination at the former mercury fulminate facility at RFS in Richmond, California. Earlier investigations indicated the presence of mercury in soils. J & A was retained in December 1989, under order 0-200248-TR to begin Phase I of this investigation. The overall objectives of the entire investigation are to:

- Collect the necessary data to verify and characterize the presence of mercury contamination;
- Determine the extent of mercury contamination in soil;
- Evaluate groundwater quality within the study area;
- Evaluate the specific risks and hazards to public health and the environment that may result from the contamination; and
- Identify the appropriate cleanup criteria and provide a quantitative basis for selection of an effective removal action.

A summary of Phase I activities is presented below:

- o Collection of 147 discrete soil samples (0 - 3 feet) from 47 boreholes;
- o Analysis of 49 composite (0 - 3 feet) soil samples for mercury;
- o Collection and analysis of 10 surface soil samples (0 - 3 inches) for mercury;

- o Analysis of four composite soil samples for sulfate and nitrate;
- o Analysis of four composite (0 - 3 feet) and two surface soil samples (0 - 3 inches) for copper and zinc;
- o Analysis of one composite soil sample for mercury using EP Toxicity and WET extraction procedures;
- o Installation of one groundwater monitoring well, MW-1;
- o Collection of 18 discrete soil samples collected during the monitoring well drilling;
- o Mercury analysis of four composite soil samples collected from the monitoring well borehole;
- o Collection and mercury analysis of one groundwater sample from monitoring well MW-1; and
- o Data analysis and report preparation.

6.2 SUMMARY OF RESULTS

Current findings to date indicate that:

- o Mercury is present in the soil above designated state and federal hazardous waste levels;
- o Mercury was not identified in groundwater;
- o Copper and zinc are present in the soil below designated state and federal hazardous waste levels; and
- o Sulfate and nitrate were detected in soil in low concentrations.

6.3 RECOMMENDATIONS

It is recommended that the following tasks be incorporated into Phase II of this investigation which is intended to serve as a preliminary Public Health and Environmental Evaluation (PHEE).

- Perform a preliminary Public Health and Environmental Evaluation (PHEE);
- Conduct field investigations as necessary to collect any additional data needed for the PHEE;
- Continue groundwater sampling and analysis; and

- Using information developed by the PHEE provide a quantitative basis for selection of an appropriate removal action.

However, the exact scope of work for the Phase II of the investigation will be finalized after UC's meeting(s) with DHS and other regulatory agencies review of this report

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APPENDIX A

Jonas & Associates Soil Sampling Laboratory Results

and

Chain-of-Custody Forms

JONAS & ASSOCIATES INC.

APPENDIX A

Jonas & Associates Soil Sampling Laboratory Results

and

Chain-of-Custody Forms

Curtis & Tompkins, Ltd., Analytical Laboratories. Since 1878
2323 Fifth Street, Berkeley, CA 94710. Phone (415) 486-0900

DATE RECEIVED: 12/27/89
DATE REPORTED: 01/04/90

LAB NUMBER: 19050

CLIENT: JONAS & ASSOCIATES, INC.

REPORT ON: 21 SOIL COMPOSITES

PROJECT #: J&A-UCRFS-101
LOCATION: UCRFS-SOIL BORING

RESULTS: SEE ATTACHED

M.E. Rivitera
QA/QC Officer

for CBG
Laboratory Director

Curtis & Tompkins Ltd

LABORATORY NUMBER: 19050
CLIENT: JONAS & ASSOCIATES, INC.
PROJECT #: J&A-UCRFS-101
LOCATION: UCRFS-SOIL BORING

DATE RECEIVED: 12/27/89
DATE ANALYZED: 01/02/90
DATE REPORTED: 01/04/90

ANALYSIS: MERCURY
PREPARATION METHOD: EPA 3020
METHOD REFERENCE: EPA 7471

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
19050-1,2,3	B11122689/ B12122689/ B13122689	3.5	mg/Kg	1.0
19050-4,5,6	B21122689/ B22122689/ B23122689	9.6	mg/Kg	1.0
19050-7,8,9	B31122689/ B32122689/ B33122689	3.3	mg/Kg	0.10
19050-10,11,12	B41122689/ B42122689/ B43122689	4.8	mg/Kg	0.10
19050-13,14,15	B51122689/ B52122689/ B53122689	19	mg/Kg	10
19050-16,17,18	B61122689/ B62122689/ B63122689	22	mg/Kg	10

QA/QC:

RPD, %	<1
RECOVERY, %	99

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 19050
CLIENT: JONAS & ASSOCIATES, INC.
PROJECT #: J&A-UCRFS-101
LOCATION: UCRFS-SOIL BORING

DATE RECEIVED: 12/27/89
DATE ANALYZED: 01/02/90
DATE REPORTED: 01/04/90

ANALYSIS: MERCURY
PREPARATION METHOD: EPA 3020
METHOD REFERENCE: EPA 7471

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
19050-19,20,21	B71122689/ B72122689/ B73122689	26	mg/Kg	10
19050-22,23,24	B81122689/ B82122689/ B83122689	28	mg/Kg	10
19050-25,26,27	B91122689/ B92122689/ B93122689	61	mg/Kg	10
19050-28,29,30	B101122689/ B102122689/ B103122689	90	mg/Kg	10
19050-31,32,33	B111122689/ B112122689/ B113122689	25	mg/Kg	10
19050-34,35,36	B121122689/ B122122689/ B123122689	180	mg/Kg	10

QA/QC:

RPD, %	<1
RECOVERY, %	99

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 19050
CLIENT: JONAS & ASSOCIATES, INC.
PROJECT #: J&A-UCRFS-101
LOCATION: UCRFS-SOIL BORING

DATE RECEIVED: 12/27/89
DATE ANALYZED: 01/02/90
DATE REPORTED: 01/04/90

ANALYSIS: MERCURY
PREPARATION METHOD: EPA 3020
METHOD REFERENCE: EPA 7471

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
19050-37,38,39	B131122689/ B132122689/ B133122689	7.4	mg/Kg	1.0
19050-40,41,42	B141122689/ B142122689/ B143122689	8.1	mg/Kg	5.0
19050-43,44,45	B151122689/ B152122689/ B153122689	27	mg/Kg	10
19050-46,47,48	B161122689/ B162122689/ B163122689	28	mg/Kg	10
19050-49,50,51	B171122689/ B172122689/ B173122689	140	mg/Kg	10
19050-52,53,54	B181122689/ B182122689/ B183122689	630	mg/Kg	450

QA/QC:

RPD, %	<1
RECOVERY, %	99

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 19050
CLIENT: JONAS & ASSOCIATES, INC.
PROJECT #: J&A-UCRFS-101
LOCATION: UCRFS-SOIL BORING

DATE RECEIVED: 12/27/89
DATE ANALYZED: 01/02/90
DATE REPORTED: 01/04/90

ANALYSIS: MERCURY
PREPARATION METHOD: EPA 3020
METHOD REFERENCE: EPA 7471

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
19050-55,56,57	B191122689/ B192122689/ B193122689	27	mg/Kg	10
19050-58,59,60	B201122689/ B202122689/ B203122689	20	mg/Kg	10
19050-61,62,63	B211122689/ B212122689/ B213122689	44	mg/Kg	10

QA/QC:

RPD, %	<1
RECOVERY, %	99

Chain of Custody Form

Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers: Romena Jonas

Job Description: UCRFS - Soil boring

Job Number: J+A - UCRFS - 101

Client Contact: Romena Jonas

Recorder: Romena Jonas

Matrix						#Containers	Method Preserved					Sample Number	Sampling Date				SAMPLE NOTES
Water	Soil	Waste	Oil				H_2SO_4	HNO_3	Ice	None	Other		Yr	Mo	Dy	Time	
	—								X			B1 1	89	12	26	9:22	Make a composite of three three & Analyze the composite for mercury. Return the original samples. Same as above.
	—								X			B1 2	89	12	26	9:22	
	—								X			B1 3	89	12	26	9:22	
	—								X			B2 1	89	12	26	10:00	
	—								X			B2 2	89	12	26	10:00	
	—								X			B2 3	89	12	26	10:00	
	—								X			B3 1	89	12	26	10:25	
	—								X			B3 2	89	12	26	10:25	same as above
	—								X			B3 3	89	12	26	10:25	
	—								X			B4 1	89	12	26	10:50	
	—								X			B4 2	89	12	26	10:50	Next page

ANALYSIS REQUESTED

EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Title 22 Metals	EPA PP Metals (#)	TPH Method-	Benzene-Toluene-Xylene(s)	Oil and Grease	EPA 608/8080 Pesticides & PCB's	Mercury 7471
										X
										X
										X

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romena Jonas 12/27/89	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for lab by (signature) Nancy Walter 12/28/89 2:00pm

Chain of Custody Form

Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers: Romena Jonas

Job Description: UCRFS - Soil boring

Job Number: J+A - UCRFS - 101

Client Contact: Romena Jonas

Recorder: Romena Jonas

Matrix: Water	Soil	Waste	Oil			#Containers	Method Preserved: H_2SO_4	HNO_3	Ice	None	Other	Sample Number	Sampling Date: Yr	Mo	Dy	Time	SAMPLE NOTES
	1								X			B4 3 1 2 2 6 8 9	8 9	1	2	2 6	10 : 50	sample part of previous
	1								X			B5 1 1 2 2 6 8 9	8 9	1	2	2 6	11 : 10	Make a Composite of these three. Analyze the composite for Mercury. Retain the original samples for future Analysis
	1								X			B5 2 1 2 2 6 8 9	8 9	1	2	2 6	11 : 10	
	1								X			B6 3 1 2 2 6 8 9	8 9	1	2	2 6	11 : 10	
	1								X			B6 1 1 2 2 6 8 9	8 9	1	2	2 6	11 : 30	
	1								X			B6 2 1 2 2 6 8 9	8 9	1	2	2 6	11 : 30	same as above
	1								X			B6 3 1 2 2 6 8 9	8 9	1	2	2 6	11 : 30	
	1								X			B7 1 1 2 2 6 8 9	8 9	1	2	2 6	11 : 45	same as above
	1								X			B7 2 1 2 2 6 8 9	8 9	1	2	2 6	11 : 45	
	1								X			B7 3 1 2 2 6 8 9	8 9	1	2	2 6	11 : 45	

ANALYSIS REQUESTED	EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Title 22 Metals	EPA PP Metals (#)	TPH Method-	Benzene-Toluene-Xylene(s)	Oil and Grease	EPA 608/8080 Pesticides & PCB's	Mercury 7471
											X
											X
											X
											X

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romena Jonas 12/27/89	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by (signature) Maney Madden 12/27/89 2000

Chain of Custody Form

Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers: Romena Jonas

Job Description: UCRFS - Soil boring

Job Number: J+A - UCRFS - 181

Client Contact: Romena Jonas

Recorder: Romena Jonas

Matrix						#Containers	Method Preserved					Sample Number	Sampling Date				SAMPLE NOTES	ANALYSIS REQUESTED															
Water	Soil	Waste	Oil				H_2SO_4	HNO_3	Ice	None	Other		Yr	Mo	Dy	Time		EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Title 22 Metals	EPA PP Metals (#)	TPH Method-	Benzene-Toluene-Xylene(s)	Oil and Grease	EPA 608/8080 Pesticides & PCB's	Mercury 7471				
1									X			BB1 1 1 2 2 6 8 9	8 9	1 2	2 6	1 2 : 1 5	Make a Composite Sample of These Three. Analyze the Composite for Mercury. Retain the Original Samples for Future Analysis											X				
1									X			BB2 1 1 2 2 6 8 9	8 9	1 2	2 6	1 2 : 1 5												X				
1									X			BB3 1 1 2 2 6 8 9	8 9	1 2	2 6	1 2 : 1 5																
1									X			BC1 1 1 2 2 6 8 9	8 9	1 2	2 6	1 2 : 4 6																
1									X			BC2 1 1 2 2 6 8 9	8 9	1 2	2 6	1 2 : 4 0	Same as above											X				
1									X			BC3 1 1 2 2 6 8 9	8 9	1 2	2 6	1 2 : 4 0																
1									X			BD1 1 1 2 2 6 8 9	8 9	1 2	2 6	1 2 : 5 5																
1									X			BD2 1 1 2 2 6 8 9	8 9	1 2	2 6	1 2 : 5 5	Same as above											X				
1									X			BD3 1 1 2 2 6 8 9	8 9	1 2	2 6	1 2 : 5 5																

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romena Jonas 12/27/89	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by (signature)

Chain of Custody Form

Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers: Romena Jones

Job Description: UCRFS - Soil boring

Job Number: J+A - UCRFS - 101

Client Contact: Romena Jones

Recorder: Romena Jones

Matrix: Water	Soil	Waste	Oil			#Containers	Method Preserved: H_2SO_4	HNO_3	Ice	None	Other	Sample Number	Sampling Date: Yr	Mo	Dy	Time	SAMPLE NOTES
	1								X			B11 1 1 2 2 6 8 9	8 9	12	2 6	1 : 1 5	Same as before
	1								X			B11 2 1 2 2 6 8 9	8 9	1 2	2 6	1 : 1 5	
	1								X			B11 3 1 2 2 6 8 9	8 9	1 2	2 6	1 : 1 5	
	1								X			B12 1 1 2 2 6 8 9	8 9	1 2	2 6	1 : 3 8	Same as before
	1								X			B12 2 1 2 2 6 8 9	8 9	1 2	2 6	1 : 3 8	
	1								X			B12 3 1 2 2 6 8 9	8 9	1 2	2 6	1 : 3 8	
	1								X			B13 1 1 2 2 6 8 9	8 9	1 2	2 6	1 : 4 5	Same as before
	1								X			B13 2 // // // //					
	1								X			B13 3 // // // //					

ANALYSIS REQUESTED	
EPA 601/8010	
EPA 602/8020	
EPA 624/8240	
EPA 625/8270	
Title 22 Metals	
EPA PP Metals (#)	
TPH Method-	
Benzene-Toluene-Xylene(s)	
Oil and Grease	
EPA 608/8080 Pesticides & PCB's	
Mercury - Method 7471	X
	X
	X

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romena Jones 12/27/89	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by (signature) 12/27/89 2000

Chain of Custody Form

Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers: Romena Jonas

Job Description: UCRFS - Soil boring

Job Number: J+A-UCRFS-101

Client Contact: Romena Jonas

Recorder: Romena Jonas

Matrix						#Containers	Method Preserved					Sample Number	Sampling Date				SAMPLE NOTES
Water	Soil	Waste	Oil				H_2SO_4	HNO_3	Ice	None	Other		Yr	Mo	Dy	Time	
	*								X			B13 12 26 89					
	1								X			B14 1 12 26 89	89	12	26	2:15	
	1								X			B14 2					Same as before (Page 3)
	1								X			B14 3					
	1								X			B15 1				2:40	
	1								X			B15 2					Same as Page 3
	1								X			B15 3					
	1								X			B16 1				3:10	
	1								X			B16 2				3:16	Same as Page 3
	1								X			B16 3					

ANALYSIS REQUESTED

EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Title 22 Metals	EPA PP Metals (#)	TPH Method-	Benzene-Toluene-Xylene(s)	Oil and Grease	EPA 608/8080 Pesticides & PCB's	Mercury 7471
/	/	/	/	/	/				/	
										X
										X
										X
										X

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romena Jonas 12/27/89	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by (signature) Mary Peters 12/27/89 2000

Chain of Custody Form

Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers: Romena Jonas

Job Description: UCRFS - Soil borings

Job Number: J+A - UCRFS - 101

Client Contact: Romena Jonas

Recorder: Romena Jonas

Matrix: Water	Soil	Waste	Oil			#Containers	Method Preserved: H_2SO_4	HNO_3	Ice	None	Other	Sample Number	Sampling Date: Yr	Mo	Dy	Time	SAMPLE NOTES
	1								X			B11 1	89	12	26	1300	Same as page 3
	1								X			B11 2		//		//	
	1								X			B11 3		//		//	
	1								X			B12 1		//		1345	
	1								X			B12 2		//		//	Same as page 3
	1								X			B12 3		//		//	
	1								X			B14 1		//		1410	
	1								X			B14 2		//		//	Same as page 3
	1								X			B14 3		//		//	
	1								X			B20 1		//		1335	
	1								X			B20 2		//		//	Same as page 3

ANALYSIS REQUESTED

EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Title 22 Metals	EPA PP Metals (#)	TPH Method-	Benzene-Toluene-Xylene(s)	Oil and Grease	EPA 608/8080 Pesticides & PCB's	Mercury - Method 7471
										X
										X
										X

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romena Jonas 12/27/89	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by (signature)
	Maureen A Patten 12/27/89 2000

Chain of Custody Form

Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers: Romena Jonas

Job Description: UCRFS – Soil boring

Job Number: J+A-UCRFS-101

Client Contact: Romena Jonas

Recorder: Romena Jonas

Matrix						#Containers	Method Preserved					Sample Number (R3) ~~sixty three~~ (63)	Sampling Date				SAMPLE NOTES
Water	Soil	Waste	Oil				H_2SO_4	HNO_3	Ice	None	Other		Yr	Mo	Dy	Time	
	X								X			63	89	12	26		same as page 3
	1								X			B26 312689	89	12	26	4:35	
	1								X			B27 112689	89	12	26	3:00	same as page 3
	1								X			B21 2					
	1								X			B21 3					

ANALYSIS REQUESTED																	
EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Title 22 Metals	EPA PP Metals (#)	TPH Method-	Benzene-Toluene-Xylene(s)	Oil and Grease	EPA 608/8080 Pesticides & PCB's	Mercury – Method 7471							
										X							
										X							
										X							

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romena Jonas 12/27/89	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by (signature)
	Harry Patterson 12/27/89 2000

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone: (415) 486-0900

DATE RECEIVED: 12/27/89
DATE REPORTED: 01/17/90

LAB NUMBER: 19172

CLIENT: JONAS & ASSOCIATES

REPORT ON: 1 SOIL COMPOSITE

PROJECT #: J&A-UCRFS-101
LOCATION: UCRFS-SOIL BORING

RESULTS: SEE ATTACHED

M. E. Printina
QA/QC Officer

Laboratory Director

Curtis & Tompkins, Ltd

LABORATORY NUMBER: 19172
CLIENT: JONAS & ASSOCIATES
PROJECT #: J&A-UCRFS-101
LOCATION: UCRFS-SOIL BORING

DATE RECEIVED: 12/27/89
DATE REQUESTED: 01/12/90
DATE ANALYZED: 01/17/90
DATE REPORTED: 01/17/90

ANALYSIS: MERCURY
METHOD REFERENCE: EP TOXICITY EXTRACTION/EPA 3020/EPA 7470

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
19172-1	B211 122689/ B212 122689/ B213 122689	ND	mg/L	0.01

ND = NONE DETECTED

QA/QC:

RPD, %	<1
RECOVERY, %	93

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

DATE RECEIVED: 01/19/90
DATE REPORTED: 01/31/90

LAB NUMBER: 19371

CLIENT: JONAS & ASSOCIATES

REPORT ON: 24 SOIL COMPOSITES

PROJECT #: J&A-UCRFS-101
LOCATION: UCRFS-SOIL BORING PHASE II

RESULTS: SEE ATTACHED

M. E. Printeza
QA/QC Officer

Laboratory Director

Curtis & Tompkins, Ltd

LABORATORY NUMBER: 19371
CLIENT: JONAS & ASSOCIATES
PROJECT #: J&A-UCRFS-101
LOCATION: UCRFS-SOIL BORING PHASE II

DATE RECEIVED: 01/19/90
DATE ANALYZED: 01/25/90
DATE REPORTED: 01/31/90

ANALYSIS: MERCURY
PREPARATION METHOD: EPA 3020
METHOD REFERENCE: EPA 7471

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
19371-1,2,3	B221011690/ B222011690/ B223011690	11	mg/Kg	1.0
19371-4,5,6	B231011790/ B232011790/ B233011790	2.2	mg/Kg	1.0
19371-7,8,9	B241011790/ B242011790/ B243011790	1.3	mg/Kg	0.10
19371-10,11,12	B251011690/ B252011690/ B253011690	0.46	mg/Kg	0.10
19371-13,14,15	B261011790/ B262011790/ B263011790	0.80	mg/Kg	0.10
19371-16,17,18	B271011790/ B272011790/ B273011790	1.2	mg/Kg	0.10
19371-19,20,21	B281011790/ B282011790/ B283011790	0.29	mg/Kg	0.10

QA/QC:

RPD, %	13
RECOVERY, %	99

Curtis & Tompkins, Ltd

LABORATORY NUMBER: 19371
CLIENT: JONAS & ASSOCIATES
PROJECT #: J&A-UCRFS-101
LOCATION: UCRFS-SOIL BORING PHASE II

DATE RECEIVED: 01/19/90
DATE ANALYZED: 01/25/90
DATE REPORTED: 01/31/90

ANALYSIS: MERCURY
PREPARATION METHOD: EPA 3020
METHOD REFERENCE: EPA 7471

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
19371-22,23,24	B291011790/ B292011790/ B293011790	0.10	mg/Kg	0.10
19371-25,26,27	B331011790/ B332011790/ B333011790	0.41	mg/Kg	0.10
19371-28,29,30	B341011790/ B342011790/ B343011790/	7.0	mg/Kg	1.0
19371-31,32,33	B301011990/ B302011990/ B303011990	4.4	mg/Kg	1.0
19371-34,35,36	B311011990/ B312011990/ B313011990	6.7	mg/Kg	1.0
19371-37,38,39	B321011990/ B322011990/ B323011990	1.4	mg/Kg	1.0
19371-40,41,42	B371011990/ B372011990/ B373011990	0.73	mg/Kg	0.10

QA/QC:

RPD, %	13
RECOVERY, %	99

Curtis & Tompkins, Ltd

LABORATORY NUMBER: 19371
CLIENT: JONAS & ASSOCIATES
PROJECT #: J&A-UCRFS-101
LOCATION: UCRFS-SOIL BORING PHASE II

DATE RECEIVED: 01/19/90
DATE ANALYZED: 01/25/90
DATE REPORTED: 01/31/90

ANALYSIS: MERCURY
PREPARATION METHOD: EPA 3020
METHOD REFERENCE: EPA 7471

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
19371-43,44,45	B381011990/ B382011990/ B383011990	2.5	mg/Kg	1.0
19371-46,47,48	B391011990/ B392011990/ B393011990	6.7	mg/Kg	1.0
19371-49,50,51	B451011990/ B452011990/ B453011990	6.1	mg/Kg	1.0
19371-52,53,54	B351011990/ B352011990/ B353011990	3.0	mg/Kg	1.0
19371-55,56,57	B441011990/ B442011990/ B443011990	1.0	mg/Kg	0.10
19371-58,59,60	B431011990/ B432011990/ B433011990	1.6	mg/Kg	0.10
19371-61,62,63	B421011990/ B422011990/ B423011990	0.16	mg/Kg	0.10
19371-64,65,66	B411011990/ B412011990/ B413011990	0.34	mg/Kg	0.10

RPD, %	13
RECOVERY, %	99

Curtis & Tompkins, Ltd

LABORATORY NUMBER: 19371
CLIENT: JONAS & ASSOCIATES
PROJECT #: J&A-UCRFS-101
LOCATION: UCRFS-SOIL BORING PHASE II

DATE RECEIVED: 01/19/90
DATE ANALYZED: 01/25/90
DATE REPORTED: 01/31/90

ANALYSIS: MERCURY
PREPARATION METHOD: EPA 3020
METHOD REFERENCE: EPA 7471

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
19371-67,68,69	B401011990/ B402011990/ B403011990	2.7	mg/Kg	1.0
19371-70,71,72	B361011790/ B362011790/ B363011790	0.23	mg/Kg	0.10

RPD, %	13
RECOVERY, %	99

Curtis & Tompkins, Ltd

LABORATORY NUMBER: 19371
CLIENT: JONAS & ASSOCIATES
PROJECT #: J&A-UCRFS-101
LOCATION: UCRFS-SOIL BORING PHASE II

DATE RECEIVED: 01/19/90
DATE ANALYZED: 01/31/90
DATE REPORTED: 01/31/90

ANALYSIS: SULFATE
METHOD REFERENCE: EPA 300.0

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
19371-1,2,3	B221011690/ B222011690/ B223011690	170	mg/Kg	70
19371-4,5,6	B231011790/ B232011790/ B233011790	230	mg/Kg	70
19371-7,8,9	B241011790/ B242011790/ B243011790	300	mg/Kg	70

QA/QC:

RPD, %	6
RECOVERY, %	95

Curtis & Tompkins, Ltd

LABORATORY NUMBER: 19371
CLIENT: JONAS & ASSOCIATES
PROJECT #: J&A-UCRFS-101
LOCATION: UCRFS-SOIL BORING PHASE II

DATE RECEIVED: 01/19/90
DATE ANALYZED: 01/31/90
DATE REPORTED: 01/31/90

ANALYSIS: NITRATE
METHOD REFERENCE: EPA 300.0

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
19371-40,41,42	B371011990/ B372011990/ B373011990	18	mg/Kg	10
19371-46,47,48	B391011990/ B392011990/ B393011990	13	mg/Kg	10
19371-61,62,63	B421011990/ B422011990/ B423011990	11	mg/Kg	10

QA/QC:

RPD, %	<1
RECOVERY, %	101

Chain of Custody Record

Harding Lawson Associates
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers: Romona Jonas

Job Description: UCRFS – Soil Boring, Phase II

Job Number: HLA – UCRFS – 101

Client Contact: Romona Jonas

Recorder: Romona Jonas

Sample Number	Matrix	#Containers	Method Preserved	Sampling Date (Yr Mo Dy Time)	SAMPLE NOTES
B22 1	Soil		Ice	90 01 16 1:50	Make 1 composite. Analyze for Mercury. Retain original sample.
B22 2	Soil		Ice	90 01 16 1:50	
B22 3	Soil		Ice	90 01 16 1:50	
B23 1	Soil		Ice	90 01 17 12:35	
B23 2	Soil		Ice	90 01 17 12:35	
B23 3	Soil		Ice	90 01 17 12:35	
B24 1	Soil		Ice	90 01 17 01:25	
B24 2	Soil		Ice	90 01 17 01:25	
B24 3	Soil		Ice	90 01 17 01:25	

ANALYSIS REQUESTED

EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Title 22 Metals	EPA 39 Metals (*)	EPA Method-	Benzene-Toluene-Xylene(s)	Oil and Grease	EPA 608/8080 Pesticides & PCB's	Mercury 7471
									X	
									X	
									X	

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romona Jonas 01/19/90	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by (signature) Nancy Lubin 1/19

1,72

Chain of Custody Record

Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers: Romena Jones

Job Description: UCRFS - Soil Boring Phase II

Job Number: J+A - UCRFS

Client Contact: Romena Jones

Recorder: Romena Jones

Matrix: Water	Soil	Waste	Oil			#Containers	Method Preserved: H_2SO_4	HNO_3	Ice	None	Other	Sample Number	Sampling Date: Yr	Mo	Dy	Time	SAMPLE NOTES	ANALYSIS REQUESTED: EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Title 22 Metals	EPA 29 Metals (*)	mpg Method-	Benzene-Toluene-Xylene(s)	Oil and Grease	EPA 608/8080 Pesticides & PCB's	Mercury Method 747.1
	1								X			826 10 11 16 9C	90	01	16	1635	make one composite											
25	1								X			827 10 11 16 9C	90	01	16	1635	Analyze for Mercury. Retain original sample											X
12	1								X			828 3	--	--	--	--												
13	1								X			826 10 11 17 9C	90	01	17	0345												
14	1								X			827 2	--	--	--	--	X same as above											X
15	1								X			828 3	--	--	--	--												
16	1								X			826 1	--	--	--	0410												
27 17	1								X			827 2	--	--	--	--	"											X
18	1								X			828 3	--	--	--	--												

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romena Jones 01/19/90	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by (signature) Nancy Lutton 1/19

Curtis & Tompkins, Ltd

2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers: Romona Jones

Job Description: UCRFS - Soil boring, March 17

Job Number: JJJ - UCRFS

Client Contact: Romona Jones

Recorder: Romona Jones

Matrix: Water	Soil	Waste	Oil			#Containers	Method Preserved: H_2SO_4	HNO_3	Ice	None	Other	Sample Number	Sampling Date: Yr	Mo	Dy	Time	SAMPLE NOTES	ANALYSIS REQUESTED: EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Title 22 Metals	EPA 99 Metals (*)	8015 Method-	Benzene-Toluene-Xylene(s)	Oil and Grease	EPA 608/8080 Pesticides & PCB's	Mercury 7471
	X								X			B24 1	01	01	17	0900	Make one composite analyze for Mercury. Retain original sample for future analysis											X
	X								X			B24 2																
	X								X			B24 3																
	X								X			B25 1				0915												
	X								X			B25 2					Same as base											
	X								X			B25 3																
	X								X			B33 1	01	01	17	0935	Same as base											
	X								X			B33 2																
	X								X			B33 3																

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romona Jones 01/19/90	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by (signature) Nancy Lehan 1/19

Chain of Custody Form

Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers: Ramona Jones

Job Description: UCRFS - Soil Boring, Phase II

Job Number: 747 - UCRFS

Client Contact: Ramona Jones

Recorder: Ramona Jones

Matrix: Water	Soil	Waste	Oil			#Containers	Method Preserved: H_2SO_4	HNO_3	Ice	None	Other	Sample Number	Sampling Date: Yr	Mo	Dy	Time	SAMPLE NOTES
	X								X			1	0	1	1	1700	Make one composite
	X								X			2					analyze for Metals
	X								X			3					Retain originals
	X								X			1	0	1	1	1530	
	X								X			2					
	X								X			3					
	X								X			1	0	1	1	1615	
	X								X			2	0	1	1	1615	
	X								X			3					

ANALYSIS REQUESTED	
EPA 601/8010	
EPA 602/8020	
EPA 624/8240	
EPA 625/8270	
Title 22 Metals	
EPA PP Metals (*)	
TPH Method-	
Benzene-Toluene-Xylene(s)	
Oil and Grease	
EPA 608/8080 Pesticides + PCB's	
	X
	X
	X

747
1/19/90

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Ramona Jones 01/19/90	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by (signature)
	Nancy Wilson 1/19

Chain of Custody Form

Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers: Romona Jones

Job Description: UCRFS - Soil boring, Phase II

Job Number: J+A - UCRFS

Client Contact: Romona Jones

Recorder: Romona Jones

B32

B37

B38

Matrix: Water	Soil	Waste	Oil			#Containers	Method Preserved: H_2SO_4	HNO_3	Ice	None	Other	Sample Number	Sampling Date: Yr	Mo	Dy	Time	SAMPLE NOTES	ANALYSIS REQUESTED: EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Title 22 Metals	EPA 39 Metals (#)	TPH Method-	Benzene-Toluene-Xylene(s)	Oil and Grease	EPA 608/8080 Pesticides & PCB's	Mercury 7471
	X								X			1	90	01	19	09:45	Analyze for Mercury. Use composite & retain original for future analysis											X
	X								X			2	90	01	19	09:45												X
	X								X			3	90	01	19	09:45												X
	X								X			1	90	01	19	10:45												X
	X								X			2	90	01	19	10:45												X
	X								X			3	90	01	19	10:45												X
	X								X			1	90	01	19	11:33	Same as B37											X
	X								X			2	90	01	19	11:33												X
	X								X			3	90	01	19	11:33												X

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romona Jones 1/19/90	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by (signature) Nancy Wilson 1/19

Chain of Custody Form

Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers: Romena Jones

Job Description: UCRFS - Soil Boring Phase II

Job Number: 54A-UCRFS-101

Client Contact: Romena Jones

Recorder: Romena Jones

Matrix						#Containers	Method Preserved					Sample Number	Sampling Date				SAMPLE NOTES
Water	Soil	Waste	Oil				H_2SO_4	HNO_3	Ice	None	Other		Yr	Mo	Dy	Time	
	X								X			B35 10 11 91 91 0	10	19	1	12:10	Composite 1-3' and analyze for Mercury
	X								X			B2 2 6 11 91 91 0	10	19	1	"	
	X								X			B35 3			"	"	
	X								X			B45 1			"	12:10	1-3' composite and analyze for Mercury
	X								X			B45 2			"	"	
	X								X			B45 3			"	"	
	X								X			B35 1			"	12:30	
	X								X			" 2			"	12:30	"
	X								X			" 3			"	"	

ANALYSIS REQUESTED																		
EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Title 22 Metals	EPA PP Metals (#)	TPH Method-	Benzene-Toluene-Xylene(s)	Oil and Grease	EPA 608/8080 Pesticides & PCB's	Mercury								
										X								
										X								
										X								

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romena Jones 01/19/92	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by (signature) Nancy Urban 1/19

Chain of Custody Form

Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers: Romona Jonas

Job Description: UCRFS - Soil boring, Phase II

Job Number: SJA-UCRFS-10

Client Contact: Romona Jones

Recorder: Romona Jones

Matrix								Method Preserved						Sample Number	Sampling Date				SAMPLE NOTES	ANALYSIS REQUESTED																
Water	Soil	Waste	Oil				#Containers	H_2SO_4	HNO_3	Ice	None	Other		Yr	Mo	Dy	Time			EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Title 22 Metals	EPA pp Metals (#)	TPH Method-	Benzene-Toluene-Xylene(s)	Oil and Grease	EPA 608/8080 Pesticides & PCB's	Mercury 7471					
	X									X			B44 55	1 0 1 1 9 9 0	9 0	0 1	1 9	0 1 : 1 5	1-3' composite											X					
	X									X			56	2					analyze for mercury											X				
	X									X			57	3																				
	X									X			58	1				2 : 3 6																
	X									X			B43 59	2					"											X				
	X									X			60	3																				
	X									X			61	1				3 : 1 5																
	X									X			B42 62	2					"											X				
	X									X			63	3																				

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romona Jonas 01/19/96	
Relinquished by (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by (signature) Mary Wilson 1/19

Curtis & Tompkins, Ltd

2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers: Romona Jones

Job Description: UCRFS - Soil Boring Phase II

Job Number: S+A - UCRFS - 181

Client Contact: Romona Jones

Recorder: Romona Jones

Matrix						#Containers	Method Preserved					Sample Number	Sampling Date				SAMPLE NOTES
Water	Soil	Waste	Oil				H_2SO_4	HNO_3	Ice	None	Other		Yr	Mo	Dy	Time	
	X								X			S1 1 0 1 1 9 2 0	9 0	0 1	0 9	3 : 3 0	1-3 Composite Analyze for metals listed on sheet
	X								X			S1 2					
	X								X			S1 3					
	X								X			S2 1				3 : 5 0	"
	X								X			" 2					
	X								X			" 3					
	X								X			B3 1	9 0	0 1	1 7	5 : 1 0	"
	X								X			" 2	9 0	0 1	1 7	5 : 1 6	"
	X								X			" 3	9 0	0 1	1 7	5 : 1 3	"

ANALYSIS REQUESTED

EPA 601/9010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Title 22 Metals	EPA 39 Metals (*)	TCLP Method-	Benzene-Toluene-Xylene(s)	Oil and Grease	EPA 608/8080 Pesticides & PCB's	Mercury 7471
										X
										X
										X

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romona Jones 01/19/90	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by (signature) Nancy Wilson 1/19

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

DATE RECEIVED: 12/27/89
DATE REPORTED: 02/28/90

LAB NUMBER: 19595

CLIENT: JONAS & ASSOCIATES

REPORT ON: 4 SOIL COMPOSITE SAMPLES

PROJECT #: J&A-UCRFS-101
LOCATION: UCRFS-SOIL BORING

RESULTS: SEE ATTACHED

M. E. Printew
QA/QC Officer

for CRG
Laboratory Director

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 19595
CLIENT: JONAS & ASSOCIATES
PROJECT #: J & A-UCRFS-101
LOCATION: UCRFS-SOIL BORING

DATE RECEIVED: 12/27/89
DATE REQUESTED: 02/15/90
DATE ANALYZED: 02/19/90
DATE REPORTED: 02/28/90

ANALYSIS: COPPER
PREPARATION METHOD: EPA 3050
METHOD REFERENCE: EPA 6010

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
19595-1	COMPOSITE B-18: B181122689 B182122689 B183122689	57	mg/Kg	1.0
19595-2	COMPOSITE B-12: B123122689 B122122689 B121122689	53	mg/Kg	1.0
19595-3	COMPOSITE B-38: B381011990 B382011990 B383011990	200	mg/Kg	1.0
19595-4	COMPOSITE B-39: B391011990 B392011990 B393011990	160	mg/Kg	1.0

RPD, %	16
RECOVERY, %	77

Curtis & Tompkins, Ltd

LABORATORY NUMBER: 19595
CLIENT: JONAS & ASSOCIATES
PROJECT #: J & A-UCRFS-101
LOCATION: UCRFS-SOIL BORING

DATE RECEIVED: 12/27/89
DATE REQUESTED: 02/15/90
DATE ANALYZED: 02/19/90
DATE REPORTED: 02/28/90

ANALYSIS: ZINC
PREPARATION METHOD: EPA 3050
METHOD REFERENCE: EPA 6010

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
19595-1	COMPOSITE B-18: B181122689 B182122689 B183122689	640	mg/Kg	0.50
19595-2	COMPOSITE B-12: B123122689 B122122689 B121122689	65	mg/Kg	0.50
19595-3	COMPOSITE B-38: B381011990 B382011990 B383011990	170	mg/Kg	0.50
19595-4	COMPOSITE B-39: B391011990 B392011990 B393011990	180	mg/Kg	0.50

RPD, %	3
RECOVERY, %	77

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 19595
CLIENT: JONAS & ASSOCIATES
JOB #: J & A-UCRFS-101
LOCATION: UCRFS-SOIL BORING

DATE RECEIVED: 12/27/89
DATE REQUESTED: 02/15/90
DATE ANALYZED: 02/26/90
DATE REPORTED: 02/28/90

Analysis: Soluble Mercury
Extraction: Waste Extraction Test (WET): CCR Title 26 Section 22-66700
Analysis Method: EPA 7471

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
19595-1	COMPOSITE B-18: B181122689 B182122689 B183122689	1.3	mg/L	0.10

QA/QC:

RPD, %	<1
RECOVERY, %	92

Chain of Custody Form

Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers: Romena Jonas

Job Description: UCRFS - Soil boring

Job Number: J+A - UCRFS - 101

Client Contact: Romena Jonas

Recorder: Romena Jonas

Sample Number	Matrix: Water	Soil	Waste	Oil			#Containers	Method Preserved: H_2SO_4	HNO_3	Ice	None	Other	Sampling Date: Yr	Mo	Dy	Time	SAMPLE NOTES
B1 1		1								X			89	12	26	9:22	Make a Composite
B1 2		1								X			89	12	26	9:22	of These Three
B1 3		1								X			89	12	26	9:22	& Analyze The-
B2 1		1								X			89	12	26	10:00	Composite For
B2 2		1								X			89	12	26	10:00	Retain The original
B2 3		1								X			89	12	26	10:00	Samples Same as above.
B3 1		1								X			89	12	26	10:25	
B3 2		1								X			89	12	26	10:25	Same as above
B3 3		1								X			89	12	26	10:25	
B4 1		1								X			89	12	26	10:50	
B4 2		1								X			89	12	26	10:50	Next page

ANALYSIS REQUESTED	
EPA 601/8010	
EPA 602/8020	
EPA 624/8240	
EPA 625/8270	
Title 22 Metals	
EPA PP Metals (#)	
TPH Method-	
Benzene-Toluene-Xylene(3)	
Oil and Grease	
EPA 608/8080 Pesticides & PCB's	
Mercury 7471	X
	X
	X
	X

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romena Jonas 12/27/89	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for lab by (signature) Nancy Foster 12/28/89 2000

Chain of Custody Form

Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers: Romena Jonas

Job Description: VCRFS - Soil boring

Job Number: J+A - VCRFS - 101

Client Contact: Romena Jonas

Recorder: Romena Jonas

Matrix: Water	Soil	Waste	Oil			#Containers	Method Preserved: H_2SO_4	HNO_3	Ice	None	Other	Sample Number	Sampling Date: Yr	Mo	Dy	Time	SAMPLE NOTES
	1								X			B4	89	12	26	10:50	Same as previous sample
	1								X			B5	89	12	26	11:01	Make a Composite of these three. Analyze the composite for ALL Retain the original samples for future Analysis
	1								X			B5	89	12	26	11:01	
	1								X			B5	89	12	26	11:01	
	1								X			B6	89	12	26	11:30	
	1								X			B6	89	12	26	11:30	same as above
	1								X			B6	89	12	26	11:30	
	1								X			B7	89	12	26	11:45	same as above
	1								X			B7	89	12	26	11:45	
	1								X			B7	89	12	26	11:45	

ANALYSIS REQUESTED

EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Title 22 Metals	EPA PP Metals (#)	TPH Method-	Benzene-Toluene-Xylene(s)	Oil and Grease	EPA 608/8080 Pesticides & PCB's	Mercury 7471
										X
										X
										X
										X
										X

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romena Jonas 12/27/89	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by (signature)
	[illegible] 12/27/89 2000

Chain of Custody Form

Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers: Romena Jonas

Job Description: UCRFS - Soil boring

Job Number: J+A - UCRFS - 181

Client Contact: Romena Jonas

Recorder: Romena Jonas

Matrix						#Containers	Method Preserved					Sample Number	Sampling Date				SAMPLE NOTES
Water	Soil	Waste	Oil				H_2SO_4	HNO_3	Ice	None	Other		Yr	Mo	Dy	Time	
	1								X			B8 1 1 2 2 6 8 9	8 9	1 2	2 6	1 2:1 5	Make a Composite Sample of These Three. Analyze the Composite For Metals. Retain the original Samples For Future Analysis
	1								X			B8 2 1 2 2 6 8 9	8 9	1 2	2 6	1 2:1 5	
	1								X			B8 3 1 2 2 6 8 9	8 9	1 2	2 6	1 2:1 5	
	1								X			B9 1 1 2 2 6 8 9	8 9	1 2	2 6	1 2:4 6	
	1								X			B9 2 1 2 2 6 8 9	8 9	1 2	2 6	1 2:4 6	Same as above
	1								X			B9 3 1 2 2 6 8 9	8 9	1 2	2 6	1 2:4 6	
	1								X			B10 1 1 2 2 6 8 9	8 9	1 2	2 6	1 2:5 5	
	1								X			B10 2 1 2 2 6 8 9	8 9	1 2	2 6	1 2:5 5	Same as above
	1								X			B10 3 1 2 2 6 8 9	8 9	1 2	2 6	1 2:5 5	

ANALYSIS REQUESTED																
EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Title 22 Metals	EPA PP Metals (#)	TPH Method-	Benzene-Toluene-Xylene(s)	Oil and Grease	EPA 608/8080 Pesticides & PCB's	Mercury 7471						
										X						
										X						
										X						

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romena Jonas 12/27/89	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by: (signature)

10-1

Chain of Custody Form

Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers: Romena Jones

Job Description: UCRFS - Soil boring

Job Number: J+A - UCRFS - 101

Client Contact: Romena Jones

Recorder: Romena Jones

Matrix: Water	Soil	Waste	Oil	#Containers	Method Preserved: H_2SO_4	HNO_3	Ice	None	Other	Sample Number	Sampling Date: Yr	Mo	Dy	Time	SAMPLE NOTES
	1						X			B1 1	89	12	26	1:15	Same as before
	1						X			B1 2	89	12	26	1:15	
	1						X			B1 3	89	12	26	1:15	
	1						X			B2 1	89	12	26	3:38	Same as before
	1						X			B2 2	89	12	26	3:38	
	1						X			B2 3	89	12	26	3:38	
	1						X			B3 1	89	12	26	4:45	Same as before
	1						X			B3 2	〃	〃	〃	〃	
	1						X			B3 3	〃	〃	〃	〃	

ANALYSIS REQUESTED	
EPA 601/8010	
EPA 602/8020	
EPA 624/8240	
EPA 625/8270	
Title 22 Metals	
EPA PP Metals (#)	
TPH Method-	
Benzene-Toluene-Xylene(s)	
Oil and Grease	
EPA 608/8080 Pesticides & PCB's	
Mercury - Method 7471	X
	X
	X

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romena Jones 12/27/89	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by (signature)
	12/27/89 2000

Chain of Custody Form

Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers: Romena Jonas

Job Description: UCRFS - Soil boring

Job Number: J+A-UCRFS-101

Client Contact: Romena Jonas

Recorder: Romena Jonas

Matrix: Water	Soil	Waste	Oil	#Containers	Method Preserved: H_2SO_4	HNO_3	Ice	None	Other	Sample Number	Sampling Date: Yr	Mo	Dy	Time	SAMPLE NOTES
	X						X			BH1 12268 9					
							X			BH1 11226 89	89	12	26	2:15	
							X			BH1 2	"	"	"	"	Same as before (Page 3)
							X			BH1 3	"	"	"	"	
							X			BH5 1	"	"	"	2:40	
							X			BH5 2	"	"	"	"	Same as page 3
							X			BH5 3	"	"	"	"	
							X			BH6 1	"	"	"	3:10	
							X			BH6 2	"	"	"	3:16	Same as page 3
							X			BH6 3	"	"	"	"	

ANALYSIS REQUESTED	
EPA 601/8010	
EPA 602/8020	
EPA 624/8240	
EPA 625/8270	
Title 22 Metals	
EPA PP Metals (#)	
TPH Method-	
Benzene-Toluene-Xylene(s)	
Oil and Grease	
EPA 608/8080 Pesticides & PCB's	
Mercury 7471	X
	X
	X

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romena Jonas 12/27/89	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by (signature)
	12/27/89 2000

Chain of Custody Form

Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers: Romena Jonas

Job Description: UCRFS - Soil borings

Job Number: J+A - UCRFS - 101

Client Contact: Romena Jonas

Recorder: Romena Jonas

Matrix						#Containers	Method Preserved					Sample Number	Sampling Date				SAMPLE NOTES
Water	Soil	Waste	Oil				H_2SO_4	HNO_3	Ice	None	Other		Yr	Mo	Dy	Time	
	1								X			B17 1	89	12	26	1300	Same as page 3
	1								X			B17 2		"		"	
	1								X			B17 3		"		"	
	1								X			B18 1		"		1345	
	1								X			B18 2		"		"	Same as page 3
	1								X			B18 3		"		"	
	1								X			B19 1		"		1410	
	1								X			B19 2		"		"	Same as page 3
	1								X			B19 3		"		"	
	1								X			B20 1		"		1435	
	1								X			B20 2		"		"	Same as page 3

ANALYSIS REQUESTED																
EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Title 22 Metals	EPA PP Metals (#)	TPH Method-	Benzene-Toluene-Xylene(s)	Oil and Grease	EPA 608/8080 Pesticides & PCB's	Mercury - Method 7471						
										X						
										X						
										X						

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romena Jonas 12/27/89	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by (signature)
	Maureen Patten 12/27/89 2000

Chain of Custody Form

Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers: Romena Jonas

Job Description: UCRFS – Soil boring

Job Number: J+A-UCRFS-101

Client Contact: Romena Jonas

Recorder: Romena Jonas

Matrix: Water	Soil	Waste	Oil			#Containers	Method Preserved: H_2SO_4	HNO_3	Ice	None	Other	Sample Number	Sampling Date: Yr	Mo	Dy	Time	SAMPLE NOTES
												(R3) Sixty Three (63)					
R3)	X								X			63	89	12	26	–	
																	same as page 3
20 (62)	1								X			B26312268989	89	12	26	4:35	
61	1								X			B21112268989	89	12	26	3:00	
21 (62)	1								X			B212	"	"	"	"	same as page 3
63	1								X			B213	"	"	"	"	

ANALYSIS REQUESTED

EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Title 22 Metals	EPA PP Metals (#)	TPH Method-	Benzene-Toluene-Xylene(s)	Oil and Grease	EPA 608/8080 Pesticides & PCB's	Mercury – Method 7471
										X
										X

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romena Jonas 12/27/89	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by (signature)
	Harry Patten 12/27/89 2:00pm

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 19172
CLIENT: JONAS AND ASSOCIATES
PROJECT #: J&A-UCRFS-101
LOCATION: UCRFS-SOIL BORING

DATE RECEIVED: 01/12/90
DATE ANALYZED: 02/01/90
DATE REPORTED: 02/02/90

LAB ID	SAMPLE ID	NITRATE EPA 300.0 mg/Kg	SULFATE EPA 300.0 mg/Kg
19172-1	B211 122689/ B212 122689/ B213 122689	44	5.9

QA/QC:

	RPD, %	RECOVERY, %
NITRATE	1	94
SULFATE	<1	99

QA/QC OFFICER

LABORATORY DIRECTOR

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

DATE RECEIVED: 02/21/90
DATE REPORTED: 03/05/90

LAB NUMBER: 19638

CLIENT: JONAS AND ASSOCIATES

REPORT ON: 10 SOIL SAMPLES &
4 SOIL COMPOSITE SAMPLES

PROJECT #: JA-UCRFS-101
LOCATION: UCRFS

RESULTS: SEE ATTACHED

QA/QC Officer

Laboratory Director

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 19638
CLIENT: JONAS & ASSOCIATES
PROJECT #: JA-UCRFS-101
LOCATION: UCRFS

DATE RECEIVED: 02/21/90
DATE ANALYZED: 02/27/90
DATE REPORTED: 03/05/90

ANALYSIS: COPPER
PREPARATION METHOD: EPA 3050
METHOD REFERENCE: EPA 6010

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
19638-16	SS4-B18-021990	140	mg/Kg	1.0
19638-21	SS9-B39-021990	110	mg/Kg	1.0

QA/QC:

RPD, %	<1
RECOVERY, %	108

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 19638
CLIENT: JONAS & ASSOCIATES
PROJECT #: JA-UCRFS-101
LOCATION: UCRFS

DATE RECEIVED: 02/21/90
DATE ANALYZED: 02/27/90
DATE REPORTED: 03/05/90

ANALYSIS: ZINC
PREPARATION METHOD: EPA 3050
METHOD REFERENCE: EPA 6010

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
19638-16	SS4-B18-021990	270	mg/Kg	0.50
19638-21	SS9-B39-021990	150	mg/Kg	0.50

QA/QC:

RPD, %	2
RECOVERY, %	106

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 19638
CLIENT: JONAS & ASSOCIATES
PROJECT #: JA-UCRFS-101
LOCATION: UCRFS

DATE RECEIVED: 02/21/90
DATE ANALYZED: 02/27/90
DATE REPORTED: 03/05/90

ANALYSIS: MERCURY
PREPARATION METHOD: EPA 3020
METHOD REFERENCE: EPA 7471

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
19638-13	SS1-B6-021990	3.9	mg/Kg	1.0
19638-14	SS2-B3-021990	4.7	mg/Kg	1.0
19638-15	SS3-B12-021990	90	mg/Kg	10
19638-16	SS4-B18-021990	240	mg/Kg	20
19638-17	SS5-B16-021990	24	mg/Kg	10
19638-18	SS6-B20-021990	1.2	mg/Kg	0.10
19638-19	SS7-B10-021990	21	mg/Kg	10
19638-20	SS8-B37-021990	13	mg/Kg	10
19638-21	SS9-B39-021990	1.1	mg/Kg	1.0
19638-22	SS10-B43-021990	0.92	mg/Kg	0.10
19638-23	COMPOSITE B46: B46-1021990 B46-2021990 B46-3021990	14	mg/Kg	1.0
19638-24	COMPOSITE B47: B47-1021990 B47-2021990 B47-3021990	4.7	mg/Kg	1.0
19638-25	COMPOSITE B48: B48-1021990 B48-2021990 B48-3021990	0.41	mg/Kg	0.10
19638-26	COMPOSITE B49: B49-1021990 B49-2021990 B49-3021990	0.32	mg/Kg	0.10

QA/QC:

RPD, %	9
RECOVERY, %	105

Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Page 1 of 3

Samplers: R. Jonas

Job Description: UCRFS

Job Number: JA-UCRFS-101

Client Contact: ~~Univers.~~ Romena Jonas (RJ)

Recorder: R. Jonas

Group	Water	Soil	Waste	Oil	#Containers	H_2SO_4	HNO_3	Ice	None	Other	Sample Number	Yr	Mo	Dy	Time	SAMPLE NOTES	Mercury 7471
B46		X						X	X		B46 1021990	90	02	19	1130	Make one composite 1-3; analyze for	
		X						X	X		B46 2021990	90	02	19	1130	Mercury. Retain	X
		X						X	X		B46 3021990	90	02	19	1130	The originals for future Analysis	
B47		X						X	X		B47 1021990	90	02	19	1150		
		X						X	X		B47 2 //	//			//	Same as above	X
		X						X	X		B47 3 //	//			//		
B48		X						X	X		B48 1021990	90	02	19	1205		
		X						X	X		B48 2 //			//		Same as above	X
		X						X	X		B48 3 //			//			

(RJ)

ANALYSIS REQUESTED: EPA 601/8010; EPA 602/8020; EPA 624/8240; EPA 625/8270; Title 22 Metals; EPA ?? Metals (*); TPH Method-; Benzene-Toluene-Xylene(s); Oil and Grease; EPA 608/8080 Pesticides & PCB's; Mercury 7471

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romena Jonas 2/20/90 2:55	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by (signature) Belinda Peters

Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

293

Samplers R. Jonas

Job Description UCRFS

Job Number JA-UCRFS-10

Client Contact Romena Jonas

Recorder R. Jonas

Matrix: Water	Soil	Waste	Oil			#Containers	Method Preserved: H_2SO_4	HNO_3	Ice	None	Other	Sample Number	Sampling Date: Yr	Mo	Dy	Time	SAMPLE NOTES
	X		X						X	X		B49	90	02	19	1235	Composite 1'-3' analyze for Mercury. Retain the original For Future Analysis
	X		X						X	X		B49 Dup	"	"	"	"	
	X		X						X	X		B3	"	"	"	"	
	X		X						X	X		B6	90	02	19	1100	
	X		X						X	X		B3	"	"	"	1110	
	X		X						X	X		B12	90	02	19	1113	
	X		X						X	X		B18	90	02	19	1117	
	X		X						X	X		B16	90	02	19	1222	
	X		X						X	X		B20	90	02	19	1227	
	X		X						X	X		B10	90	02	19	1352	
	X		X						X	X		B37	90	03	19	1138	

B49
SS1-B6-021990
SS2-B3-021990
SS3-B12-021990
SS4-B18-021990
SS5-B16-021990
SS6-B20-021990
SS7-B10-021990
SS8-B37-021990

(R3)

ANALYSIS REQUESTED

EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/9270	Title 22 Metals	EPA 39 Metals (#)	EPA Method-	Benzene-Toluene-Xylene(s)	Oil and Grease	EPA 608/8080 Pesticides & PCB's	Mercury 7471	Copper	Zinc
										X		
										X	X	X

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romena Jonas 2/20/90 2:55	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by (signature) Belinda Peters

Jones & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers R. Jonas 303

Job Description UCRFS

Job Number JA-UCRFS-101

Client Contact Romena Jonas

Recorder R. Jonas

Matrix						#Containers	Method Preserved					Sample Number	Sampling Date				SAMPLE NOTES	ANALYSIS REQUESTED												
Water	Soil	Waste	Oil				H_2SO_4	HNO_3	Ice	None	Other		Yr	Mo	Dy	Time		EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Title 22 Metals	EPA 39 Metals (+)	TPH Method-	Benzene-Toluene-Xylene(s)	Oil and Grease	EPA 608/8080 Pesticides & PCB's	Mercury 7471	Copper	Zinc	
	X								X			59-B3	90	02	17	0900												XX	X	X	
	X								X			510-B13	90	02	19	0915												XX	X	X	

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Time	Received by (signature)
Romena Jonas 2/20/90, 2:55	
Relinquished by: (signature) Date/Time	Received by (signature)
Relinquished by: (signature) Date/Time	Received by (signature)
Relinquished by: (signature) Date/Time	Received by (signature)
Dispatched by: (signature) Date/Time	Received for Lab by (signature) Calvin Peters

Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878
2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

DATE RECEIVED: 02/26/90
DATE REPORTED: 03/08/90

LAB NUMBER: 19697

CLIENT: JONAS & ASSOCIATES

REPORT ON: 4 SOIL COMPOSITES &
1 WATER SAMPLE

PROJECT #: JA-UCRFS-101
LOCATION: UCRFS

RESULTS: SEE ATTACHED

QA/QC Officer

Laboratory Director

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 19697
CLIENT: JONAS & ASSOCIATES
PROJECT #: JA-UCRFS-101
LOCATION: UCRFS

DATE RECEIVED: 02/26/90
DATE ANALYZED: 03/06/90
DATE REPORTED: 03/08/90

ANALYSIS: MERCURY
METHOD REFERENCE: EPA 7470

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
19697-13	MW122590	ND	mg/L	0.001

ND = NONE DETECTED

QA/QC Summary:

RPD, %	2
RECOVERY, %	113

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 19697
CLIENT: JONAS & ASSOCIATES
PROJECT #: JA-UCRFS-101
LOCATION: UCRFS

DATE RECEIVED: 02/26/90
DATE ANALYZED: 03/02/90
DATE REPORTED: 03/08/90

ANALYSIS: MERCURY
METHOD REFERENCE: EPA 7471

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
19697-1,2,3	MWB1322490/ MWB12.522490/ MWB24.522490	36	mg/Kg	10
19697-4,5,6	MWB3522490/ MWB35.522490/ MWB3622490	27	mg/Kg	10
19697-7,8,9	MWB46.522490/ MWB4722490/ MWB47.522490	24	mg/Kg	10
19697-10,11,12	MWB5822490/ MWB58.522490/ MWB5922490	2.7	mg/Kg	1.0

QA/QC Summary:

RPD, %	8
RECOVERY, %	106

Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 19697
CLIENT: JONAS & ASSOCIATES
PROJECT #: JA-UCRFS-101
LOCATION: UCRFS

DATE RECEIVED: 02/26/90
DATE ANALYZED: 03/02/90
DATE REPORTED: 03/08/90

ANALYSIS: TOTAL DISSOLVED SOLIDS
METHOD REFERENCE: EPA 160.1

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
19697-13	MW122590	1,300	mg/L	25

QA/QC:

RPD, %	4

Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

11677

Samplers: R. Jonas

Job Description: UCRFS

(R3) Job Number: FA-UCRFS-101

Client Contact: Romena Jonas

Recorder: R. Jonas

Matrix						#Containers	Method Preserved					Sample Number	Sampling Date				SAMPLE NOTES
Water	Soil	Waste	Oil				H_2SO_4	HNO_3	Ice	None	Other		Yr	Mo	Dy	Time	
	X								X			MW B1 3 2 2 4 9 0	90	02	24	0910	composite and analyze for Mercury. Retain original Sample for future Analysis
	X								X			MW B1 2.5			✓		
	X								X			MW B2 4.5		✓		0930	
	X								X			MW B3 5 2 2 4 9 0	90	02	24	0935	composite and analyze for Mercury. Retain original for future Analysis
	X								X			MW B3 5.5 2 2 4 9 0	90	02	24	0935	
	X								X			MW B3 6 2 2 4 9 0	90	02	24	0935	

ANALYSIS REQUESTED											
EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Title 22 Metals	EPA 3p. Metals (#)	TPH Method-	Benzene-Toluene-Xylene(s)	Oil and Grease	EPA 608/8080 Pesticides & PCB's	Mercury 7471	
										X	
										X	
										X	
										X	

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romena Jonas 2/26/90 3:20	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received by Lab by (signature) 2-26-90 15:20

1272

Berkeley, California 94710
(415) 486-0900

Samplers R. Jonas

Job Description UCRFS

Job Number SA-UCRFS-101

Client Contact Romena Jonas

Recorder R. Jonas

Matrix: Water	Soil	Waste	Oil			#Containers	Method Preserved: H_2SO_4	HNO_3	Ice	None	Other	Sample Number	Sampling Date: Yr	Mo	Dy	Time	SAMPLE NOTES
	X								X			MW B4 6.5	90	02	24	0914	Composite and values for Mercury. Return the original sample for future analysis
C3 8	X								X			MW B4 7	90	02	24	0940	
9	X								X			MW B4 7.3	90	02	24	0940	
10	X								X			MW B5 8	90	02	24	0950	Same as above
C4 11	X								X			MW B5 8.5	"	"	"	"	
12	X								X			MW B5 9	"	"	"	"	

EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Title 22 Metals	EPA 29 Metals (#)	TPH Method-	Benzene-Toluene-Xylene(s)	Oil and Grease	EPA 608/8080 Pesticides & PCB's	Mercury 74-7					
										X					
										X					
										X					

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Romena Jonas 2/26/90 3:20	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
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Curtis & Tompkins, Ltd
2323 Fifth Street
Berkeley, California 94710
(415) 486-0900

Samplers: R. Jonas

Job Description: UCRFS

Job Number: JA-UCRFS-101

Client Contact: Rowena Jonas

Recorder: R. Jonas

	Matrix						#Containers	Method Preserved					Sample Number	Sampling Date				SAMPLE NOTES
	Water	Soil	Waste	Oil				H_2SO_4	HNO_3	Ice	None	Other		Yr	Mo	Dy	Time	
13	X									X			MW1 22590	90	02	25	0205	

EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Title 22 Metals	EPA 39 Metals (*)	TPH Method-	Benzene-Toluene-Xylene(s)	Oil and Grease	EPA 508/8080 Pesticides & PCB's	TDS	Mercury
										X	X

Laboratory Notes :

Chain of Custody Record

Relinquished by: (signature) Date/Hr	Received by (signature)
Rowena Jonas 2/26/90 3:20	
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Relinquished by: (signature) Date/Hr	Received by (signature)
Dispatched by: (signature) Date/Hr	Received for Lab by (signature) 2/26/90 16:20